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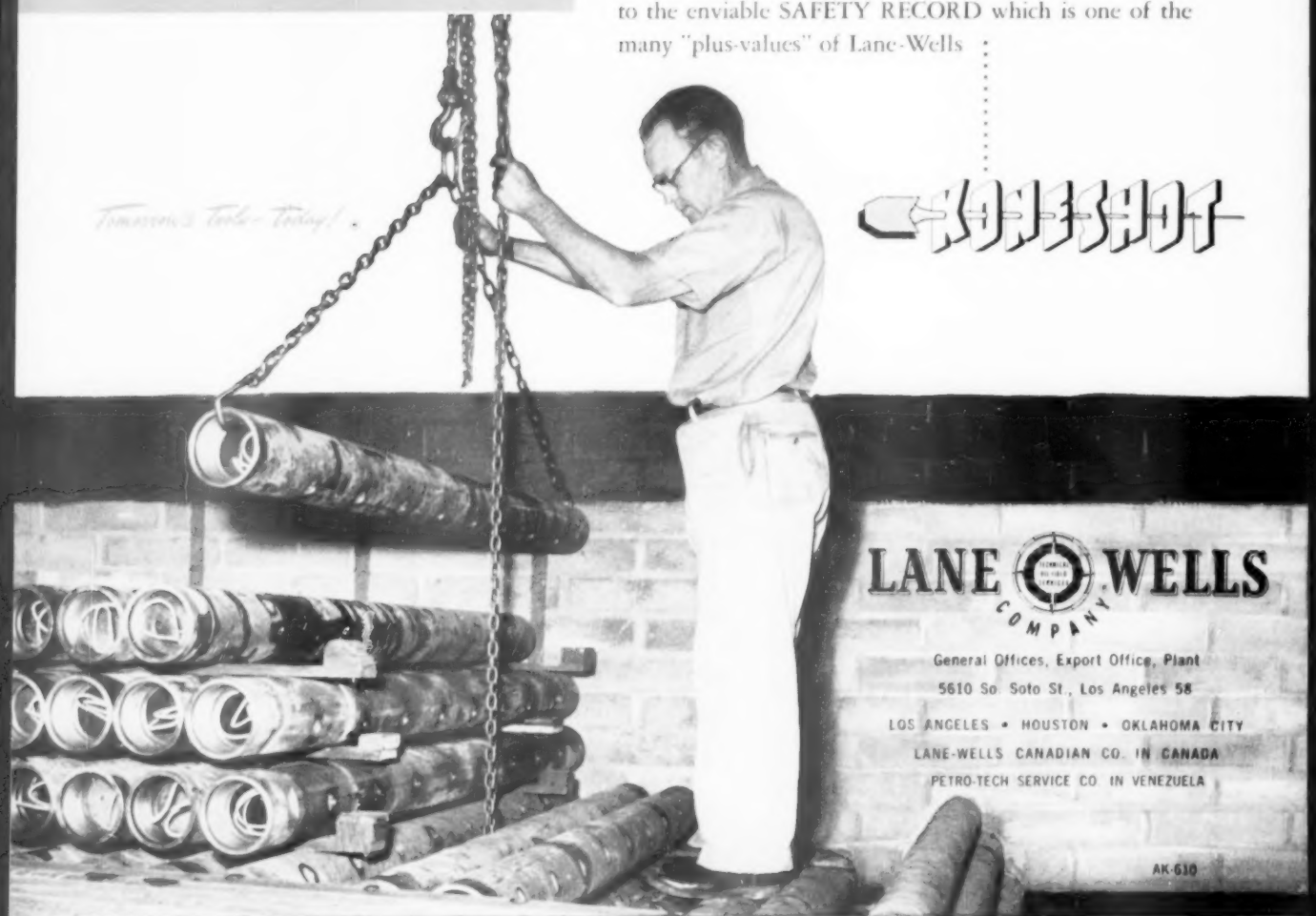

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JANUARY 11, 1954 VOL. 52 NO. 36

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In Brief . . .

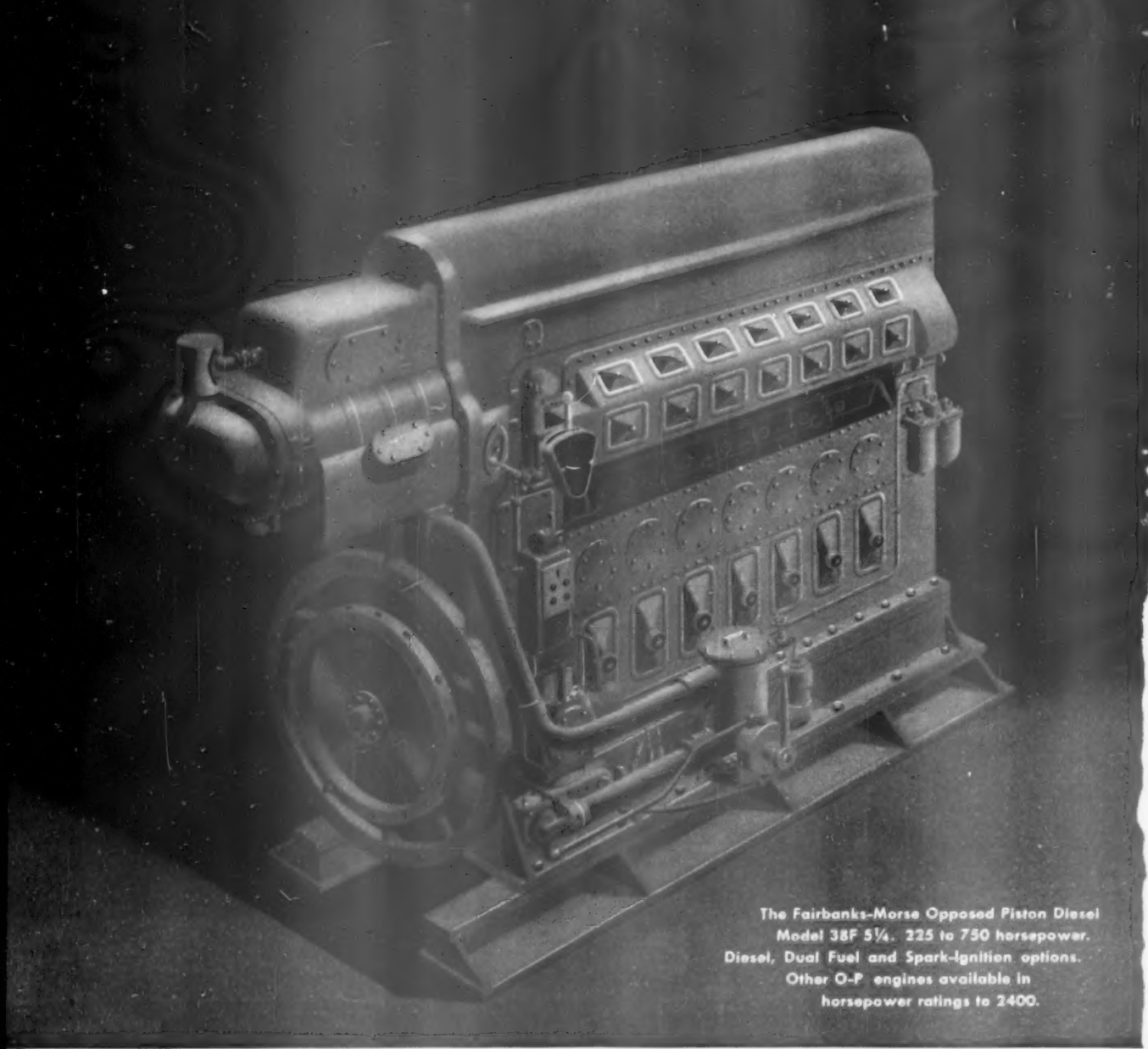
1. BETTER MAINTENANCE . . . Results of studies made on 103 cooling towers in the Gulf Coast area indicate that: (1) proper water treatment can prevent excessive deterioration and minimize infection; (2) prevalence of decay is not sufficient to warrant use of treated lumber; (3) high operating temperatures intensify surface attack; (4) if pH and water inlet temperatures are controlled within reasonable limits, total wood lost by all types of deterioration should be nominal. These studies are continuing.

2. NEW MEXICO OIL . . . The similarity of the San Juan basin and the original Raton-Rowe-Mora-Las Vegas basin is very significant. It is believed that the Mesaverde (Pierre shale) lenticular sands have a possibility of proving productive in northeastern New Mexico, as they have in the San Juan basin. The Dakota sandstone where found deeply buried and in a structural position, should be as productive as in other areas. In the Raton basin, the production possibilities of the Wingate sandstone should not be overlooked. Santa Rosa sandstone and Pennsylvanian rocks may also prove productive.

3. BETTER LOADING . . . Spray loading is operating successfully and does definitely cut loading losses. In some of Magnolia Petroleum Co.'s operations that formerly had losses as high as 5 per cent, loading loss has been virtually eliminated. Advantages of the method include: (1) Elimination of the venting of vapor—this means more profit from company operations; (2) reduction in loading time; and (3) reduction in the amount of equipment—one fewer hose and fittings is needed.

4. GOOD GREASE BASE . . . Petroleum wax can be oxidized to form a saponifiable base which may be used for the production of lubricating greases with outstanding properties. The oxidation process utilizes atmospheric air with zinc stearate and colloidal manganese dioxide as catalyst. The air is introduced continuously into a stirred reactor maintained at approximately 275° F. The oxidation period requires about 4.5 hours. Sodium-base grease made from oxidized wax is a good high-temperature lubricant. Lithium-base grease is an excellent multipurpose lubricant.

5. DESIGNING OUT VIBRATIONS . . . When adequate foundations are put under engines and compressors and pulsations are dampened close to the source, there remains to determine the vibration susceptibility of the piping system. Place pipe supports at intervals to keep natural vibration frequency above highest pulsation harmonics. This and 14 other recommendations will decrease the magnitude of vibratory conditions.



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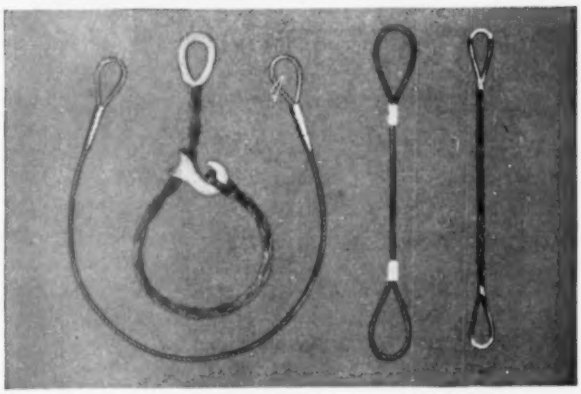

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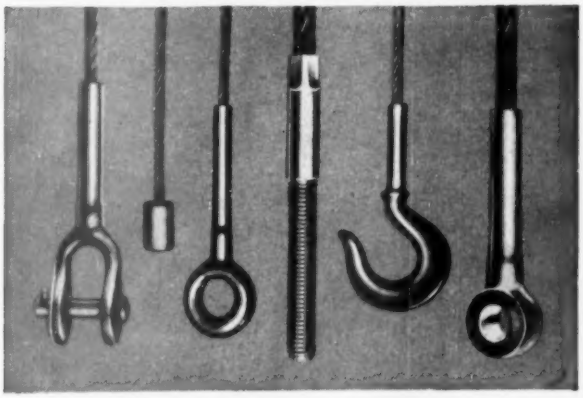

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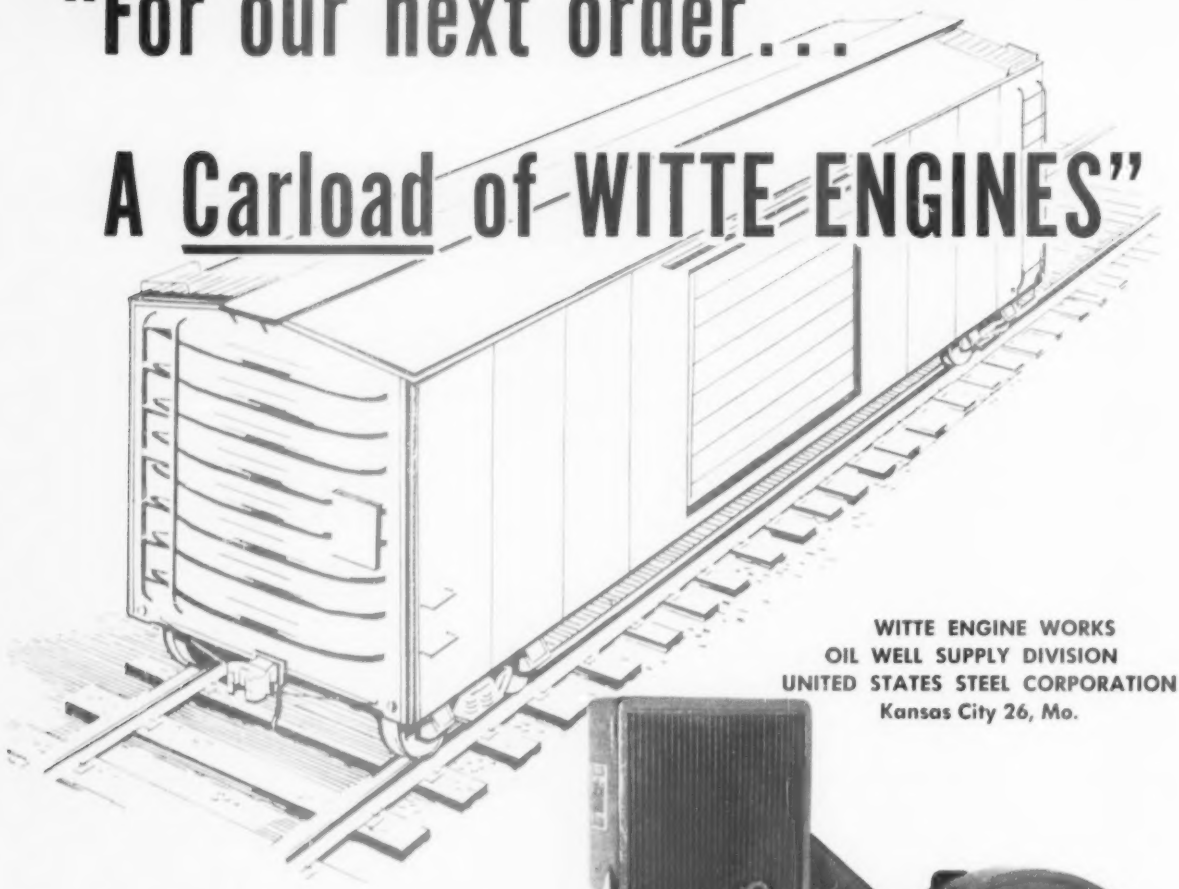

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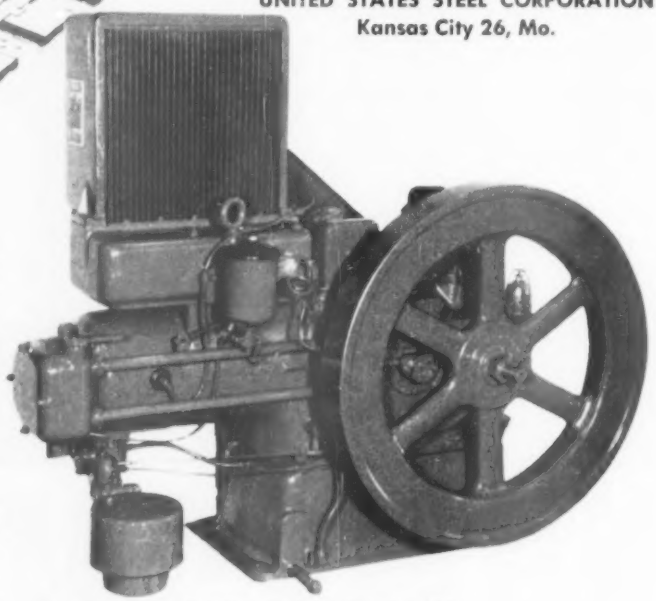

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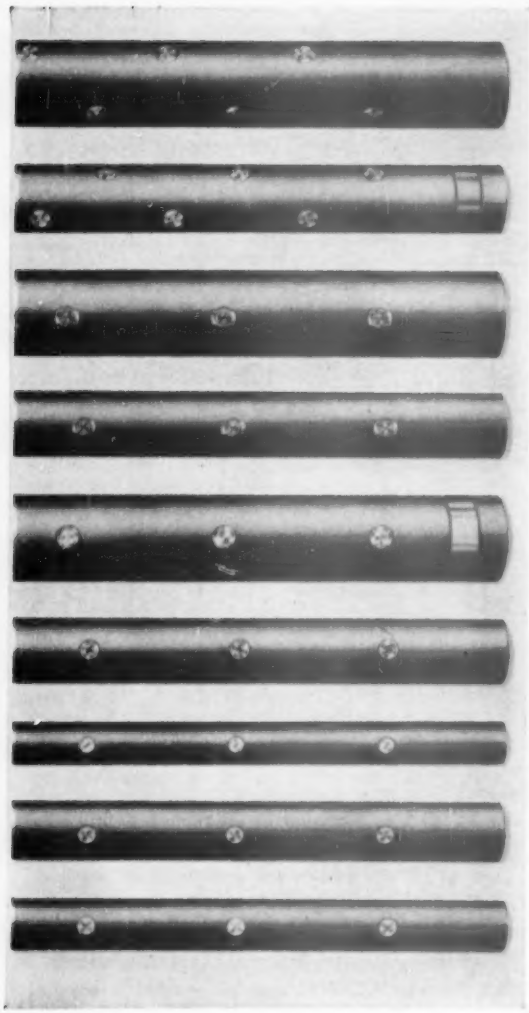

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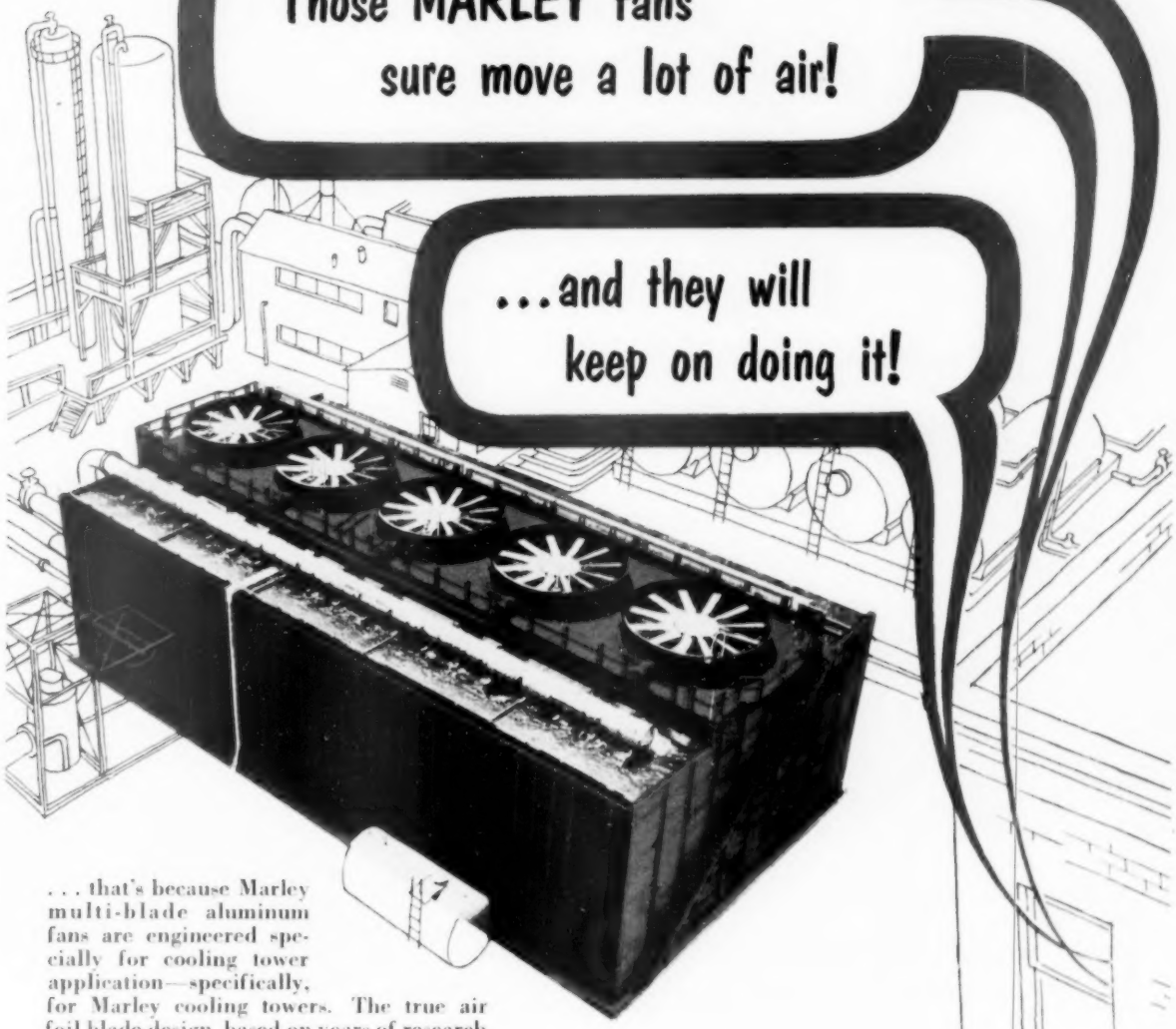

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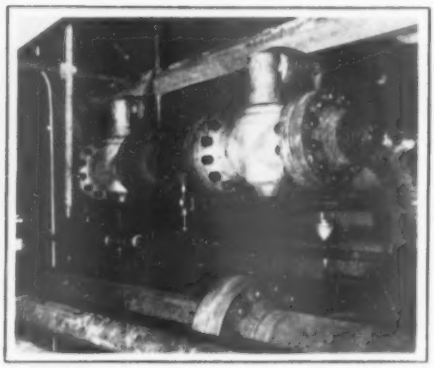
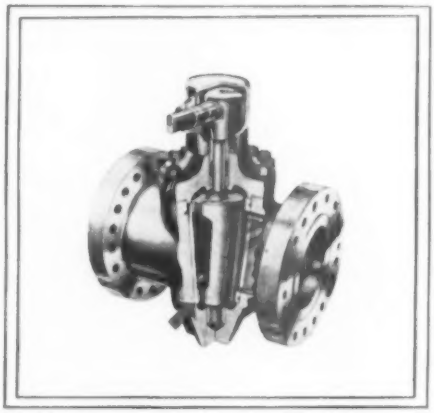


• 10-inch, ASA 900 Lb. Class, Cameron Non-Lubricated Lift Plug Valves in a refinery platforming unit.



• Cut-away view of a Model 53 Cameron Non-Lubricated Lift Plug Valve. Note the separate seat (arrow) which may be easily replaced without removing the valve from the line.

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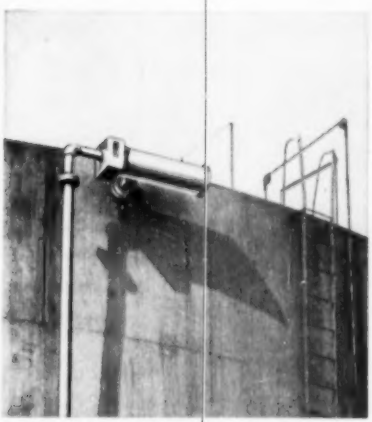
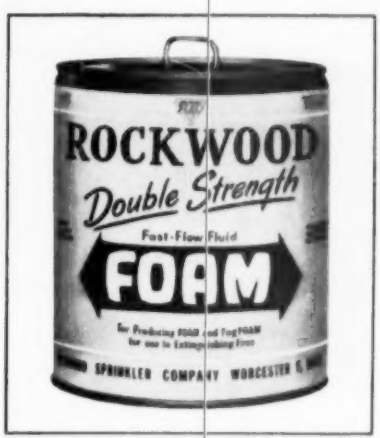
ROCKWOOD SPRINKLER COMPANY

Engineers Water . . . to Cut Fire Losses

How Rockwood Engineers Water to Cut Fire Losses



The Rockwood Double-Barrelled Foam Maker Chamber has a patented, compact design that eliminates supporting brackets, makes it easy to install. Also easy to inspect from top of tank. Wide range of sizes.



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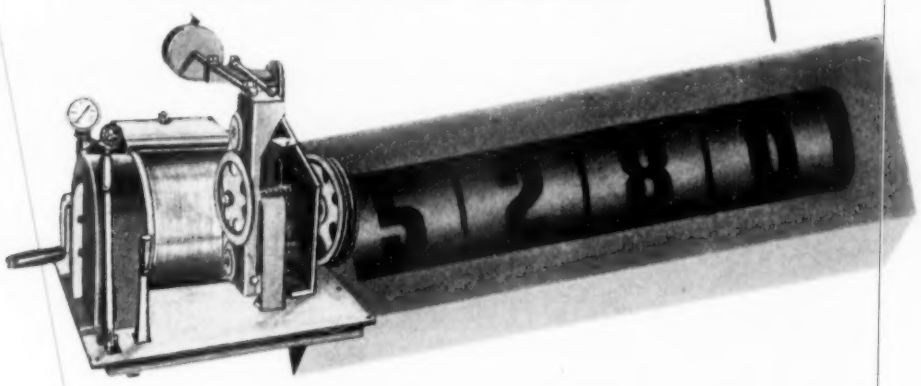

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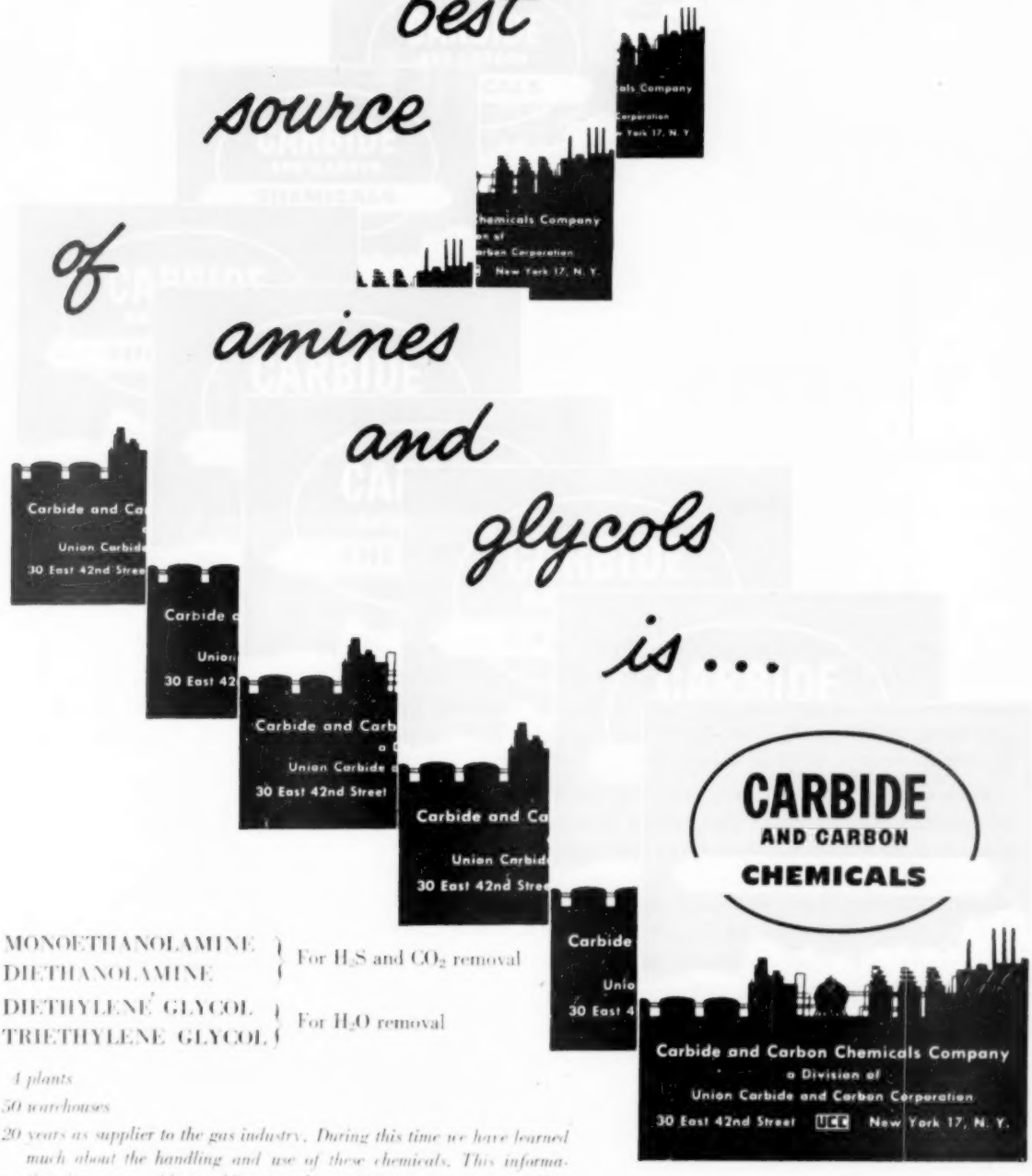
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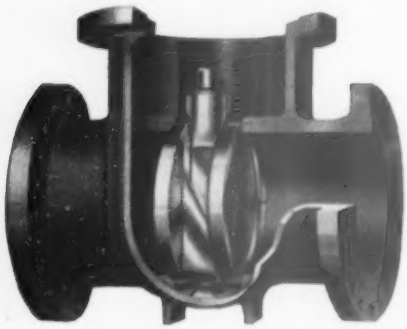
MONOETHANOLAMINE
DIETHANOLAMINE
} For H_2S and CO_2 removal

DIETHYLENE GLYCOL
TRIETHYLENE GLYCOL
} For H_2O removal

4 plants
50 warehouses
20 years as supplier to the gas industry. During this time we have learned much about the handling and use of these chemicals. This information is yours, without obligation, by writing to our nearest office.

Cutaway showing extreme simplicity of Darling's unique fully revolving double disc parallel seat gate valve principle.



TROUBLE-FREE SERVICE

because it's a DARLING cast steel pipe line gate valve

Darling 20" motor-operated series 600 gate valve of the revolving disc type on a major oil line.

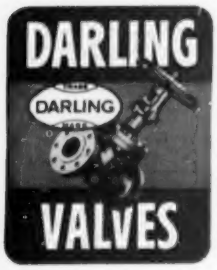
LET'S go on record that there's probably no other pipe line valve that can match a Darling gate valve in *avoiding* the most common operating troubles. Darling users have been finding this out on all their cross-country lines.

Back of it is Darling's *fully revolving double disc parallel seat principle.* This results in automatic compensation for valve body distortion, uniform distribution of disc and seat wear, and positive closing. And, naturally, these things add up to longer valve life *with the lowest maintenance and least trouble.*

If you're not already using Darling Pipe Line Gate Valves, it will pay you to take a few minutes to get fully acquainted with the unique Darling double revolving disc principle and its many advantages.

SEND FOR DATA

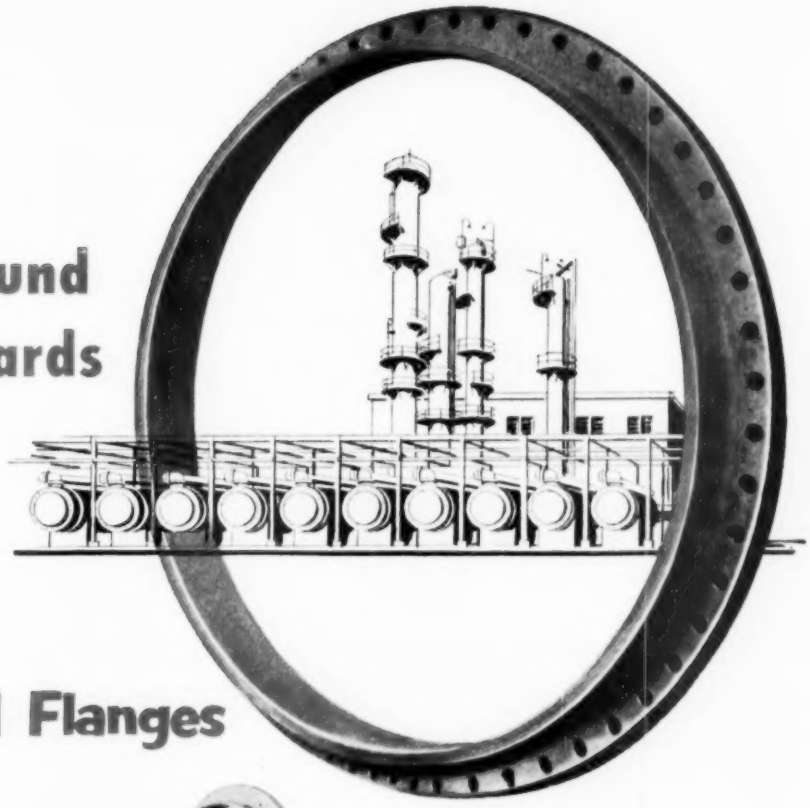
Darling Parallel Seat Gate Valves come in a wide range of sizes and types for all gas and oil line requirements. Simply outline your particular service needs or ask for a complete descriptive bulletin.



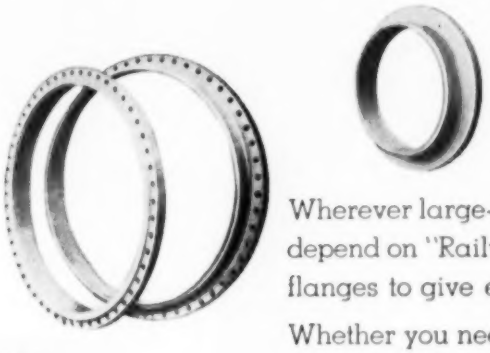
DARLING VALVE & MANUFACTURING CO.
Williamsport 1, Pa.
Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ont.

FOR PLUS VALUES, JOB-PROVED AGAIN AND AGAIN

all-around safeguards



Railway Steel Flanges



Wherever large-diameter flanges are required, you can depend on "Railway" high quality carbon or alloy steel flanges to give extra service, extra product-protection.

Whether you need standard or special types, including flanges built to TEMA standards, you'll find a type to meet your requirements in sizes ranging from 18 in. ID to 150 in. OD.

Why not discuss the superior points of "Railway" Steel Flanges with one of our sales representatives in the following cities: Chicago, Cleveland, Houston, New York, Richmond, San Francisco, St. Louis, St. Paul and Tulsa.*

Ardun Supply Company

For brake rims, gear blanks and circular forgings of many types, specify "Railway." To assure highest dependability in the finished products, we make the high quality steels in our own plants.

Railway Steel Flanges

RAILWAY STEEL-SPRING DIVISION
AMERICAN LOCOMOTIVE COMPANY

Highly specialized process controls are used to produce the finest in seamless WELDING FITTINGS

Only Globe, among manufacturers of welding fittings, produces its own seamless steel tubes. Specialized processes at every stage of manufacture from billet to tube — to fitting — insure uniform high quality. Thorough inspection and continuous laboratory control guarantee strict conformity to rigid specifications.

Now . . . you can get these high-quality fittings when you need them — in the quantities you want. Just get in touch with your nearest Globe distributor.

GLOBE STEEL TUBES CO., Milwaukee 46, Wisconsin
Chicago • Cleveland • Detroit • New York • Philadelphia • St. Louis
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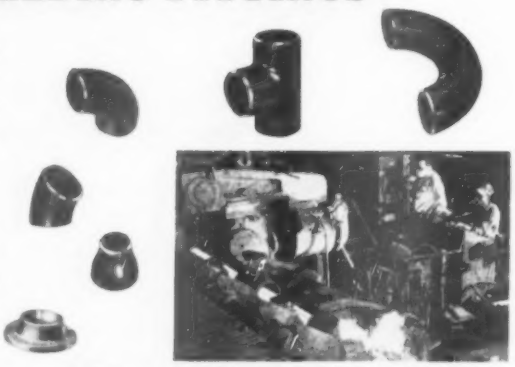
Producers of Globe Welding Fittings — Globe seamless stainless steel tubes — alloy — carbon seamless steel tubes — Gloweld welded stainless steel tubes — Globeiron (high purity ingot iron) seamless tubes.



Here is one of the highly specialized manufacturing operations that insure Globe quality — piercing the billet to form a seamless tube.

AVAILABLE IN A COMPLETE LINE OF SIZES AND WEIGHTS THROUGH GLOBE DISTRIBUTORS IN ALL KEY CITIES

Send for the Globe Welding Fittings catalog.

PETROLEUM CHEMICALS DIVISION
NEWS

January ★ One of a Series of Interest to the Petroleum Industry ★ 1954

New Bronze Gasoline Dye Available from Du Pont

The mixing of several gasoline dyes to obtain a desired color has long been an inconvenience to refiners.

Simplify Operations

If you have had this problem in creating a bronze color, it will now be easy to simplify your dye addition operations. Du Pont Oil Bronze makes this possible.

The new Du Pont bronze dye is a free-flowing powder that can be easily handled in dry eductor systems as well as in any other commercial method of gasoline dye addition.

Highly Soluble

Oil Bronze has a total solubility in synthetic gasoline of 4500 grams of dye per 100 U.S. gallons. Speed of solution is extremely rapid.

This new bronze dye is ready for shipment in standard 100-pound containers . . . also in 50-pound, 25-pound and smaller size packages. Samples and full details on Du Pont Oil Bronze are available from any Du Pont Petroleum Chemicals Division representative or district office listed on back page.

BRIEFCASE PRESENTATION PACKAGE

For those desiring a nutshell version of the presentation described in the feature article at right, miniature lube oil show kits are available.

The flannelboard itself measures 9⅝ by 13⅜ inches. In spite of its compactness, the miniature presentation can be clearly and easily read.

Small enough to be stuffed in a briefcase—with room to spare, they can be easily carried wherever your salesmen go. And they take only a few seconds to set up for an informal desk-top presentation.

If you would like to examine one of these miniature boards, your Du Pont representative can obtain one for you.

New Tool to Help Dealers Promote More Frequent Oil Changes

Unique lube oil show designed by Du Pont is personalized to point up quality features of your own motor oil

The need for frequent oil change—and the value of this service to the car owner—represents a real profit opportunity for your dealers. But getting them to see this opportunity . . . and to *do something about it* . . . has long been a major problem for marketing executives.

IT WILL BE EASY FOR YOUR DEALERS to understand from this flannelboard presentation that "good oil seldom wears out . . . but it can become dirtied to death." Also, that it *pays to change oil frequently.*

To help stimulate your dealers to go after this market, Du Pont has developed a new lube oil show. The theme is "good oil seldom wears out . . . but it can become dirtied to death."

Visual-Aid Tool

The show can be easily presented by any oil company representative. To make it simple, clear-cut and easy to understand, the presentation is built up progressively on a flannelboard. This unique and highly flexible visual-aid technique permits the presentation to be specially tailored to fit any oil company's individual needs.

The Plot

The theme of the presentation is developed to bring out the following points.

Typical lubricating oil molecules must perform five important functions all at once. They must lubricate, protect, cool, seal and clean.

In doing these jobs, good oil seldom wears out in the engine. But even the

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

PETROLEUM CHEMICALS DIVISION
NEWS

JOHN F. SHAW

Assistant Central District Manager

JOHN F. SHAW was recently appointed assistant manager of the Petroleum Chemicals Division's Central District.

Previous to this assignment, he was a sales supervisor in the Division's West Coast District. He joined the Du Pont Company in 1947.

Mr. Shaw graduated from the University of Texas in 1934 with a B.S. degree in Mechanical Engineering. His first job after college was with the Reed Roller Bit Company. He later became chief engineer of this company's tank transmission plant.

In 1944 he joined the Crum-Brainard Company as chief engineer. There he was in charge of design and manufacturing operations of oil well drilling tools. He then joined the Waldrip Engineering Company as chief design engineer.

Mr. Shaw is a member of the American Society of Mechanical Engineers and the American Petroleum Institute.

CONTINUED *"Lube Oil Show"*

best oil eventually becomes *dirtied to death*—by acids, dust, carbon, metal, gum and dilution. And it must be changed.

Adding more clean oil is of little help. Clean oil added to dirty oil makes just one thing—more dirty oil.

Low-Cost Insurance

The speaker delivering the presentation can emphasize the fact that frequent oil changes are cheaper than engine repairs . . . and in the best interest of the customer.

Thus, a dealer can promote his oil change service as a low-cost insurance policy on the life of the car owner's engine. To help him do this, the lube oil show supplies him with a variety of powerful, easy-to-remember selling points.

Personalized For You

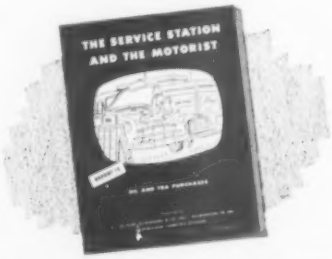
The individual points emphasized in the presentation can be personalized to bring out the special quality features of your own brand of motor oil.

A complete script – which can be easily varied to fit the speaker's own presentation style – is supplied with each flannelboard kit. This too, can be personalized to dramatize your own important sales points. Detailed instructions for presentation are also included with the kits.

If you are interested in having one of these personalized lube oil presentations made up for use in your own dealer meetings, we suggest that you talk over the details with a Du Pont Petroleum Chemicals Division representative.

Oil and TBA Purchase Habits Studied in Du Pont Survey

Report No. 5 in Du Pont's continuing study of service station customer buying habits is now being distributed to oil company marketing executives.



This report covers the purchase patterns in oil and TBA items. Like the other reports in the series on gasoline buying habits, and brand and dealer loyalty, this report is based on 3,100 household interviews and 21,000 observations at 1,193 service stations. The survey is national in scope.

Who Buys Oil Where

Of all the motorists surveyed, 74% buy their motor oil at the same place they buy gasoline. The remaining 26% buy oil from a variety of sources – mainly other service stations, car dealers and mechanics' garages. A much smaller percentage purchase at chain stores, mail order houses and from "friends who get it for them."

Brand preference was the chief reason given for purchasing oil at sources other than the regular gasoline supplier. Superior service, convenience and personal friendship were also mentioned as reasons.

Among motorists who have a favorite brand of motor oil, the survey found that quality belief is the chief factor in their choice.

TBA Merchandising

From actual observations, it was found that for every 200 customer stops at service stations, only one of these produced a tire sale. However, it was also observed that only one out of every 1,000 customers was *offered* tires by station attendants. Buying habits for batteries and oil filters are also included in the latest survey report.

It is expected that this Du Pont survey will be extremely valuable to oil company marketers for pinpointing oil and TBA merchandising opportunities . . . and in developing plans to capitalize these opportunities.

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. . . through Chemistry

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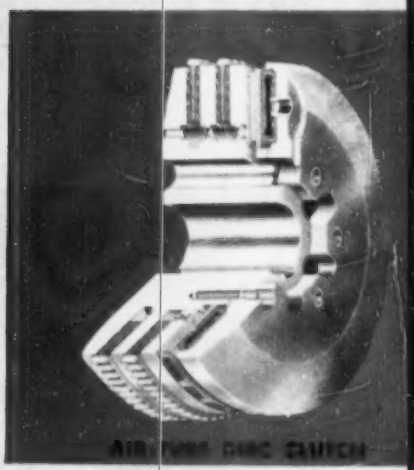
A-6504

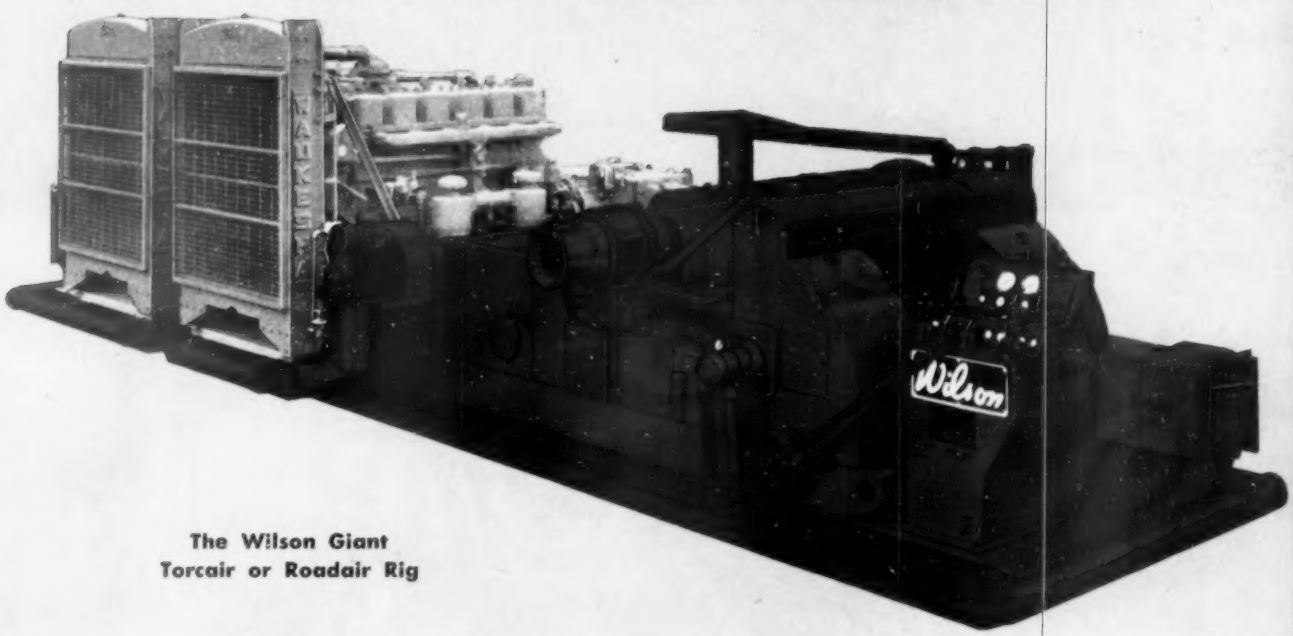
Printed in U.S.A.

DON'T BUY AN OBSOLETE RIG!

an 8 wheeled auto? Makes about as much sense as a rig manufacturer using three or four kinds of clutches on a rig . . .



BE MODERN-BUY WILSON!



The Wilson Giant Torcair or Roadair Rig

Wilson is the ONLY Drilling Rig Manufacturer Building ALL FRICTION CLUTCH DRIVE RIGS! . . . and Wilson uses ONLY ONE TYPE OF CLUTCH . . . the Famous Air-Tube Disc Clutch. Why worry with an obsolete Jaw clutch transmission? Be Modern—Buy Wilson.

Wilson

The FIRST NAME in DRILLING RIGS!

WILSON MANUFACTURING CO., Inc.

THE HOME OF RED IRON

WICHITA FALLS, TEXAS, U.S.A.

Designed and rated to

NATIONAL PUMPING UNITS

pump the well dry—

Here's why your best buys for profitable pumping are in the complete line of National Pumping Units:

Each model, individually engineered to provide long service life under specific loads, is the result of National Supply's continuing research and development program—plus decades of "know-how" in oil field equipment manufacturing. Each National Pumper is:

RUGGEDLY BUILT—heavy-duty frame with welded construction at all extreme stress points;

SAFETY ENGINEERED—counterweights designed for easy, safe adjustment;

EXCEPTIONALLY LONG-LIVED—precision-made for less wear, longer service under all operating conditions;

CONSERVATIVELY RATED—extra stamina and capacity—the two well-known bonus values built into all National Pumpers—provide for smooth operation even at extreme loads.

Facts and figures on the National Pumping Unit that's best for your well are readily obtainable from the National Supply Representative in your area. Why not talk over your particular pumping unit requirements with him now?

First in quality . . .
First in supply service
in oil country everywhere

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DIVISION OFFICES: Denver, Ft. Worth, Houston, Pittsburgh, Tulsa, Torrance
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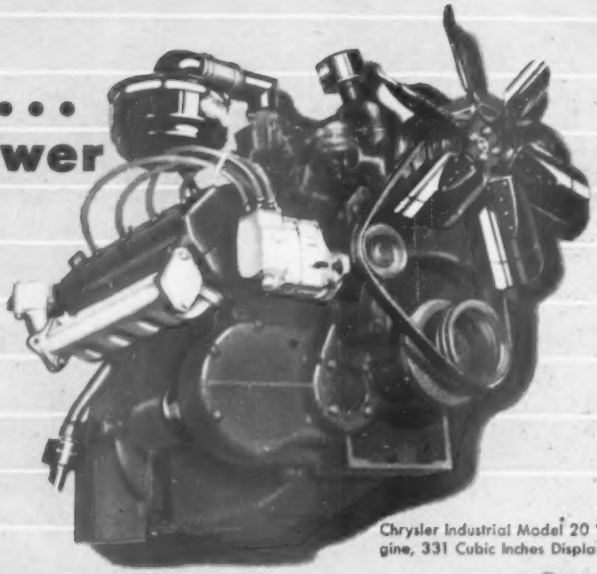
NATIONAL OIL FIELD MACHINERY AND EQUIPMENT • SPANG STEEL PIPE • SUPERIOR & ATLAS ENGINES

A MODEL FOR EVERY JOB

National's line of Pumping Units is so complete that there is a model to economically suit every pumping job. Ranging from a 3200 pound API rated walking beam unit to a 32,400 pound API rated walking beam model—National Pumping Units are available in *38 standard combinations*, in beam or crank counterweighted types.

For greater PAY in your PAYloads... specify *CHRYSLER* power

Chrysler Industrial Model 16 Engine, 265 Cubic Inches Displacement.



Chrysler Industrial Model 20 V-8 Engine, 331 Cubic Inches Displacement.

Chrysler Open Power Units include the complete engine, skid base, radiator and grille, instruments and instrument panel, flywheel and flywheel housing. (Pictured is V-8 Open Power Unit, which also includes a twenty-five gallon fuel tank.)

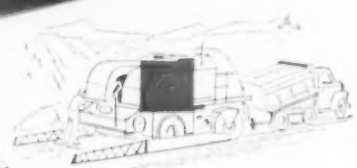
Chrysler Enclosed Power Units have the complete engine, instruments, instrument panel, skid base, fuel tank, radiator and grille, as well as fully enclosing sheet metal—side panels and hood top panel.

There are ten Chrysler Industrial Engines and Power Units, from 217 cubic inches to 413 cubic inches displacement. All of them operate with gasoline, natural gas or L-P gas fuels.

True to the Chrysler tradition, these engines, both In-line 6 and V-8, are among the most advanced design, best engineered and most powerful engines available today in their power ranges. Yet, thanks to famed Chrysler Research, they are constructed of lightweight, highly alloyed steels and allow amazing horsepower to weight ratios.

They are, therefore, ideal engines for most any equipment, regardless of size or silhouette. Let our nearest dealer give you more details, you'll be agreeably surprised to know how inexpensive Chrysler Power—*equipped to meet your specifications*—is . . . that's because Chrysler production facilities and manufacturing know-how allow us to custom-equip engines and make them available at mass-production prices.

Install Chrysler with confidence. Our nationwide dealer organization assures you good service and fast parts availability. If you prefer, write us: ***Dept. 141, Industrial Engine Division, Chrysler Corporation, Trenton, Michigan.***



Street Paving Machine—powered with Chrysler Industrial Engine.

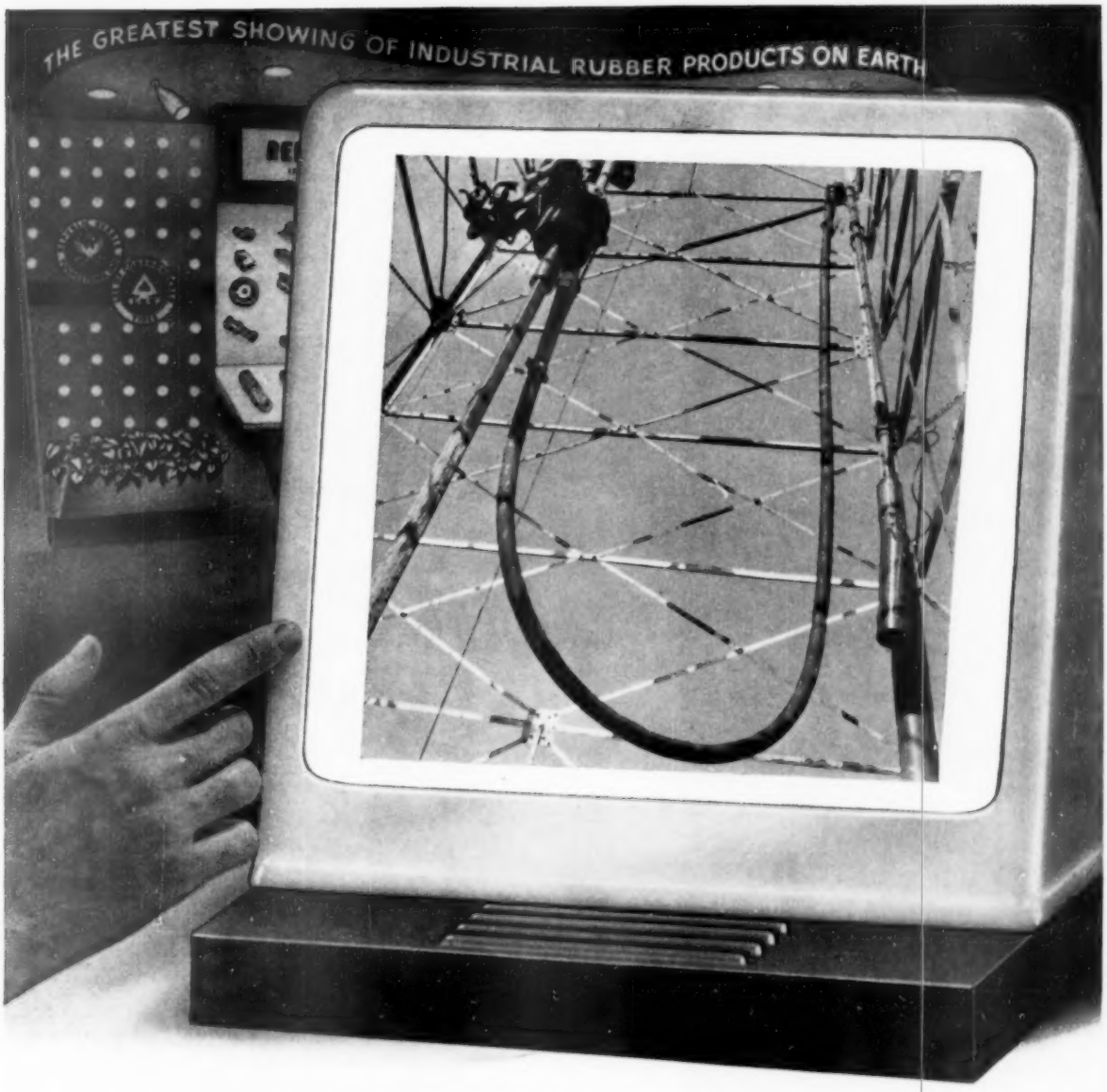
Farm Combine—powered with Chrysler Industrial Engine.

One-Half Yard Shovel—powered with Chrysler Industrial Engine.

Fork Truck—powered with Chrysler Industrial Engine.

CHRYSLER
Industrial Engines

HORSEPOWER WITH A PEDIGREE



"CHAMPION" For A Champion

Your rig can be a champion, too! . . . a champion in efficiency and low-cost operation . . . a champion tour after tour, with fewer breakdowns and better production records. How? SPECIFY Republic's Champion Rotary Drilling Hose . . .
a rotary drilling hose that will earn its right to work on your rig.
Champion Rotary Drilling Hose is designed to stand up longer under high, pulsating pressures. There are no bolts or flanges to catch on the rigging. The special flush-fitting, streamlined couplings, **hydraulically locked into** the hose carcass, will not leak or work loose.
Your specialized Republic Oil Field Distributor can show the way to operating economy with Industrial Rubber Products. Call him soon or write directly to us.

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REPUBLIC RUBBER DIVISION
LEE RUBBER & TIRE CORPORATION, YOUNGSTOWN 1, OHIO
INDUSTRIAL RUBBER PRODUCTS

WEST COAST DISTRIBUTORS
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405 Towne Ave., Los Angeles, Calif.
Pacific Coast Rubber Company
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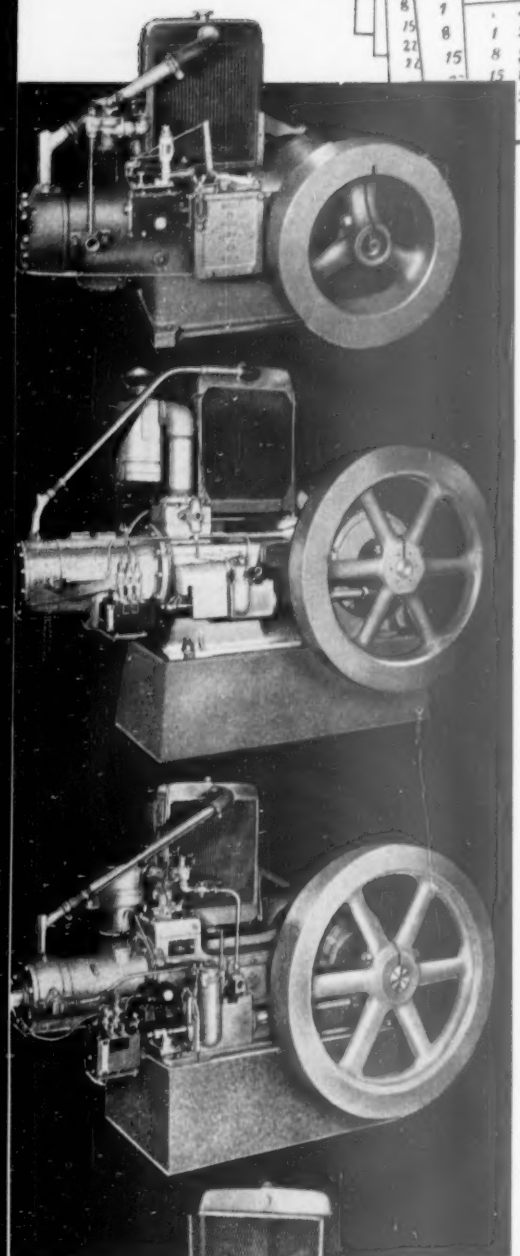

Engines that run by the year!

Your sturdy AJAX Engine—turning steadily, powerfully, smoothly under load—will maintain its pace by the month and year with little attention and even some neglect thrown in!

That's because AJAX is an *oilfield* engine all the way. It is built for seldom-visited operation in remote leases, as well as right under your thumb—glad of an annual oil change if you'll be so good, and requiring an on-location overhaul only at very long intervals.

Any model AJAX will work like that for you. And you've got the industry's only COMPLETE LINE to choose from. Write us for descriptive bulletins—and see your Supply Man for a full discussion of your needs.

Gas and Oil Engines

Builders of GAS AND OIL ENGINES, PRESSURE PUMPS,
STEAM DRILLING ENGINES, INDUSTRIAL STEAM ENGINES

CORRY, PENNSYLVANIA

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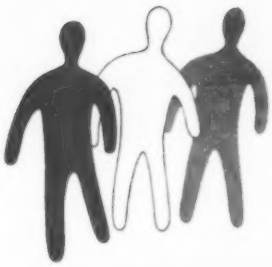
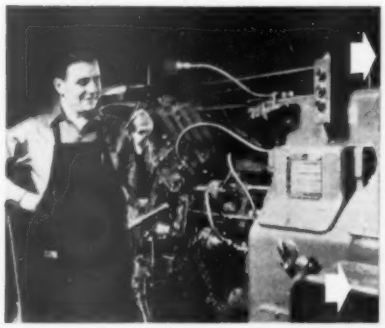


HERE'S WHAT HAPPENS WHEN REPUBLIC'S 3-D METALLURGICAL SERVICE GOES INTO ACTION



The field metallurgist comes right into your plant. He checks furnace temperatures and heating cycles, machines, set-ups, feeds, speeds, everything which affects your production.

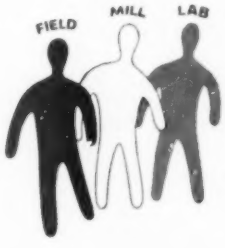
He talks to your plant and engineering people, asks questions, finds out what you want your alloy steels to do. He takes this data with him.

The Republic Field Metallurgist talks over his report with Republic's Mill Metallurgist. Experienced in producing alloy steels, he adds his knowledge, checks it against your problem. And since Republic controls its alloy steels from ore to finished product, he can trace heats of steel.

The field metallurgist next talks things over with the Republic Laboratory Metallurgist. His data on tests of alloy steels is added to the material of the field and mill metallurgist.

Then, all three men put their heads together and come up with a recommendation that is the result of pooling their findings and their experience with alloy steels. And since Republic pioneered the manufacture of alloy steels, this recommendation is based on solid data.

The Republic Field Metallurgist passes this recommendation on to your engineers and plant personnel. He works with them to see that your problem is solved satisfactorily, right in your plant. It's his job to see that you get all the advantages out of the alloy steels you use.



The results often include lower production costs, better quality, or even changes in design. You can have this free service by calling your local Republic Steel sales office.

REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Dept.: Chrysler Bldg., New York 17, N.Y.

REPUBLIC STEEL

Republic ALLOY STEELS

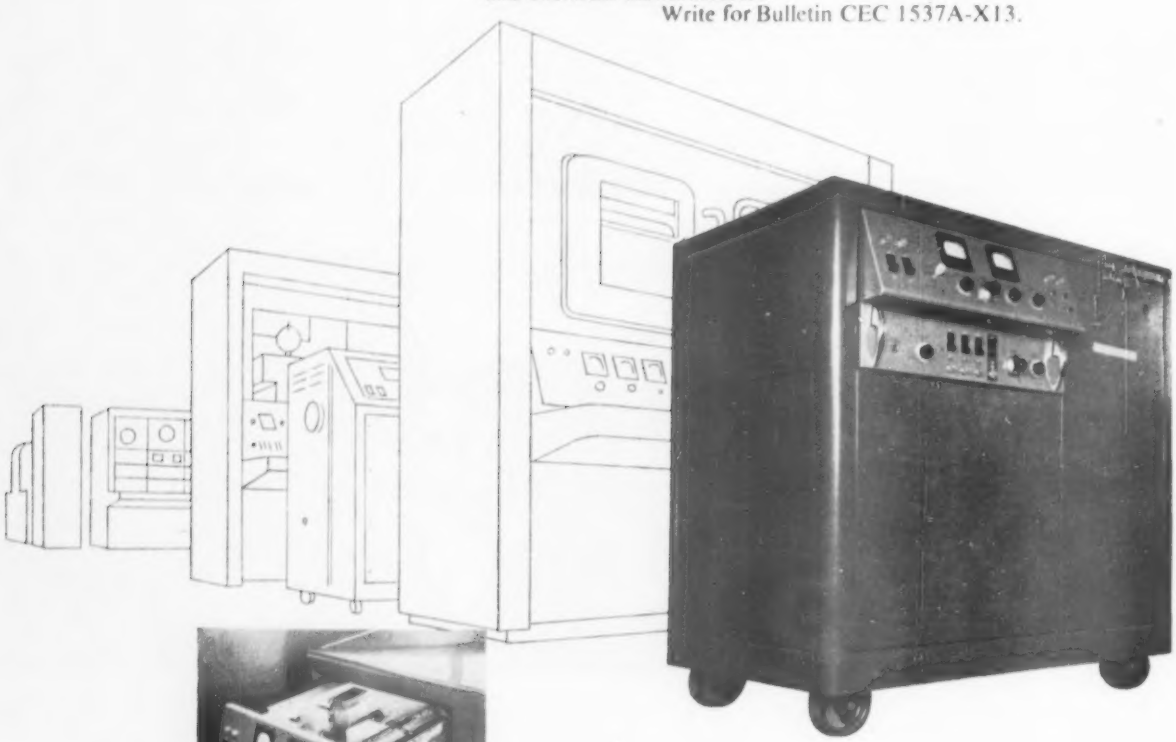
Other Republic Products Include Carbon and Stainless Steels—Sheets, Strip, Plates, Pipe, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing.

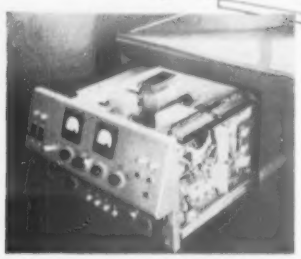
Newest in the line . . .

A single instrument for
Process control
Leak detection
Research

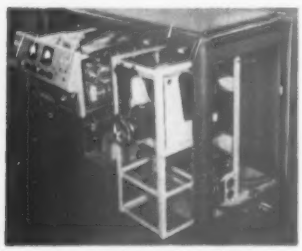
THE latest mass spectrometer in America's accepted standard line is the Consolidated Model 21-610, a precision electronic instrument with extreme stability for unattended process monitoring in the petro-chemical industries. Used with a hand-held probe it operates as a detector for tracing leaks of any gas within its mass range. The Model 21-610 is suitable for qualitative and quantitative component determinations in gaseous and light-liquid mixtures. Moderately priced and economical to operate, needing no expensive refrigerants, this new instrument brings mass spectrometry as a control procedure within reach of small refineries and chemical manufacturers.

Write for Bulletin CEC 1537A-X13.





All components are accessible: either by removing side panels or by pull-out chassis containing circuits and controls.



Electronic and vacuum/analyzer assemblies may be removed intact and operated independently.

Model 21-610 Mass Spectrometer

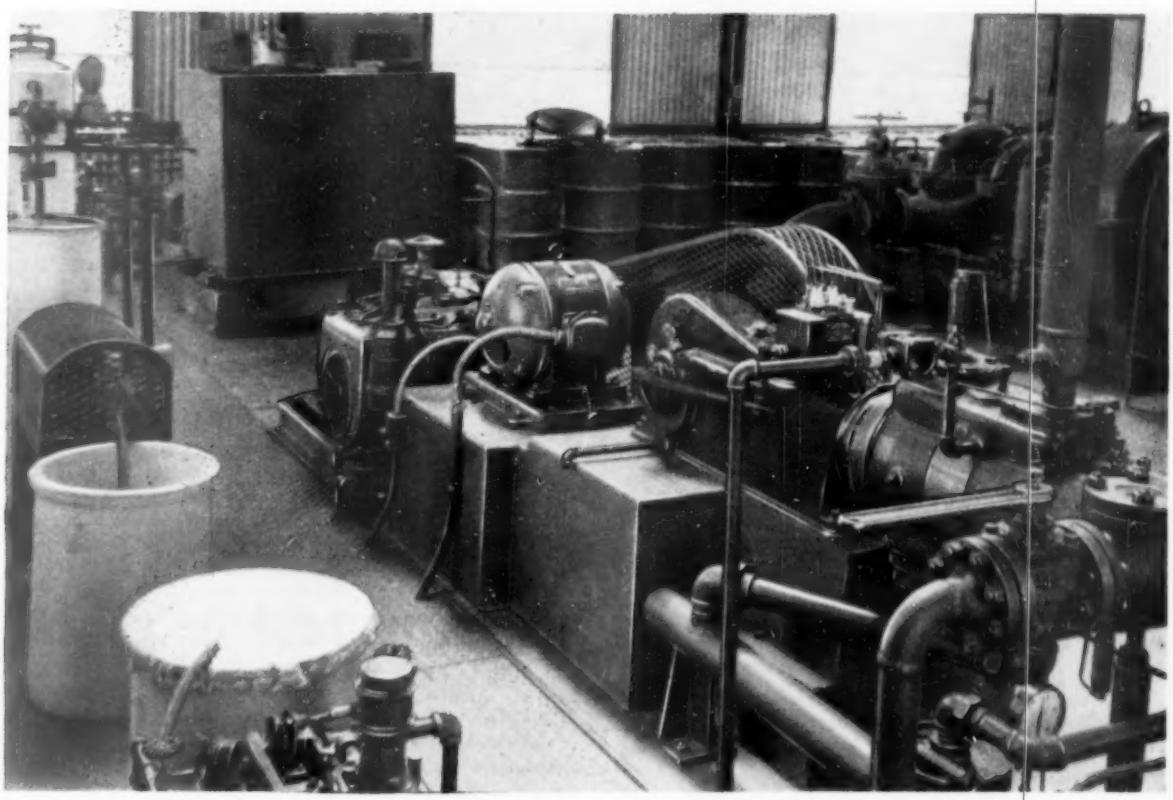
Consolidated Engineering
CORPORATION

300 North Sierra Madre Villa, Pasadena 15, California

Sales and Service through **CEC INSTRUMENTS, INC.,** *a subsidiary with offices in: Pasadena, New York, Chicago, Washington, D. C., Philadelphia, Dallas.*

analytical instruments for science and industry

Field tests prove **ARQUAD T-2C** cuts costs of secondary oil recovery and gives corrosion protection for your system!



Right here in the field, Armour's new Arquad T-2C has been tried, tested and *proved* by large petroleum producers. The results — over 95% corrosion protection reported in every case (in some cases, 99.5%) and complete control of sulphate reducers! Arquad T-2C also means less plugging of sands, less down-time for filter cleaning. And Arquad T-2C is an extremely *economical* corrosion inhibitor and bactericide — only 6 ppm does the job!

For free samples of Arquad T-2C and further information on all of Armour's Arquads (quaternary ammonium chlorides), send the coupon today! Technical Bulletin E-6, "Chemical Treatment of Oil Wells", and Technical Bulletin G-3, "Combat Corrosion", are also available. And remember that our research and development laboratory is equipped and ready to help you with your problems.

ARMOUR CHEMICAL DIVISION

© Armour and Company 1355 W. 31st St., Chicago 9, Ill.

Mail this coupon with your letterhead

Armour Chemical Division
1355 W. 31st Street, Chicago 9, Illinois

Please send me:

☐ Arquad T-2C sample ☐ Arquads booklet
☐ Tech. Bull. E-6 ☐ Tech. Bull. G-3

Name _____

Title _____

Firm _____

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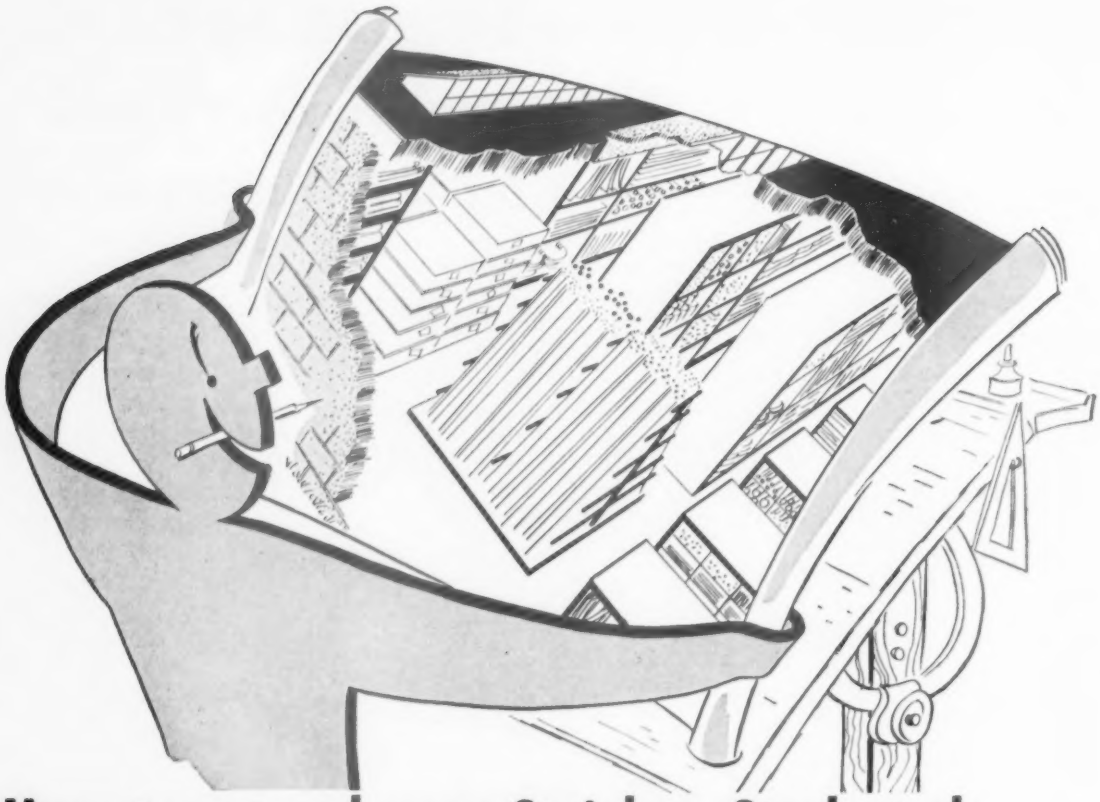
City _____ Zone _____ State _____



How to expand your Stainless Steel stock

—at no extra cost to you!

Why carry a big inventory of stainless steel to be sure you always have the exact type, grade, and size on hand? It's a practice that ties up working capital and floor space —increases payroll and overhead.

Let us carry your stainless steel stock in our warehouses. Let us show you service that's practically as fast as getting the stock from your own racks. You can count on Metal Goods Corporation to give you the *convenience* of your own stockroom *plus* the completeness of large warehouse stocks of stainless located in the Central South, Southwest, and Rocky Mountain regions. And *all this without the cost* of carrying any stainless in stock yourself!

Call the nearest Metal Goods Corporation representative today—he's ready to help you.

METAL GOODS CORPORATION

Also distributors of aluminum, brass, copper, nickel*, monel*, inconel*, and steel.

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Phone: 4-7536, 4-7537

San Antonio, Texas
2012 Alamo Natl. Bldg.
Charles I. MacKenzie
Phone: GArfield 3161

Memphis, Tennessee
713 Columbian Mutual Tower Bldg.
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Phone: 5-8721

Fort Worth, Texas
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John M. Turbitt
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GENERAL OFFICES: ST. LOUIS 15, MISSOURI

**Not stocked in St. Louis and Kansas City*

Want valves that are fast- and safe?

You are looking at one of the toughest jobs ever assigned to a valve.

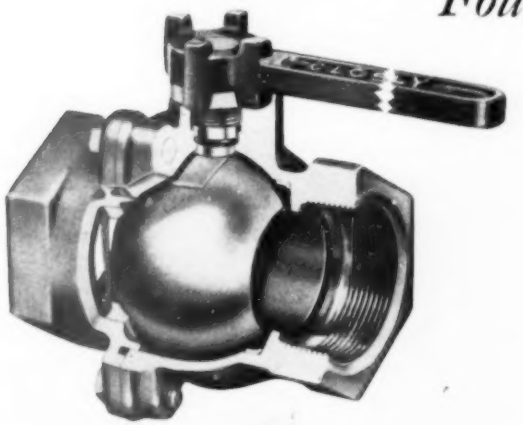
That's why they put Rockwood Ball Valves on duty in the Globe Oil & Refining Co. bulk plant at Lemont, Ill. The flow has to be full and round — valves must open and close in trigger time — to keep tank trucks going and coming in minimum time. And since this is around-the-clock performance, it takes the toughness of a Rockwood to stand the pace.

But — it has to be absolutely leak-proof, too. Oil sludge over the loading area pavement would mean a great fire hazard. When a Rockwood Ball Valve closes, it's *shut* positively.

This company wouldn't consider any valve but Rockwood for the job. Neither would you, after you get the details.

24 Hours a Day trucks come and go at the Globe Oil & Refining Co. bulk plant at Lemont, Ill. Quick transfer of petroleum products *with safety* calls for special features. Rockwood Ball Valves have them.

Four features you need...



1. **Full round flow** — no turbulence in fluid stream.
2. **Leakproof** — after continued use.
3. **Quick opening and closing** — with quarter-turns under full pressure.
4. **Longer life** — longer periods between replacement and no maintenance.

Tested and listed by Underwriters' Laboratories, Inc. Comes in all pipe sizes.

ROCKWOOD

ROCKWOOD

THE FLOW IS AS ROUND AS THE PIPE ITSELF

***FULL-FLOW* BALL VALVES**

ROCKWOOD SPRINKLER COMPANY
104 Harlow Street
Worcester 5, Mass.

Send me illustrated folder V-4 on Rockwood Full-Flow Ball Valves.

Name .....
Title .....
Company .....
Street .....
City ..... Zone ..... State .....

YOU GET MORE!

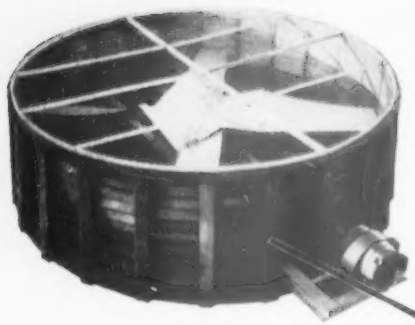
There are many reasons why you get more from Pritchard Heavy-Duty Cooling Towers. One of these is the exclusive patented features incorporated into Pritchard advanced cooling tower design.

Features like the POWAIRSAVER* fan—the first fan exclusively designed, built, rated and tested on an induced draft cooling tower for cooling tower service. These lightweight fans are designed for longer life with corrosion-resistant stressed skin blade surfaces, made of monel metal or stainless steel depending upon your specific service requirements. These patented fans are designed to operate with high aero-dynamic efficiency at low horsepower—your key to top cooling tower performance.

Over the years, leaders in the petro-chemical industry have learned *all* the reasons why Pritchard cooling towers give them more. If *you* want more efficiency . . . more years of dependable performance . . . from your next cooling tower, be sure to consult Pritchard—a founder member of the Cooling Tower Institute.

*Registered Trade Name

Industry's Partner for Progress



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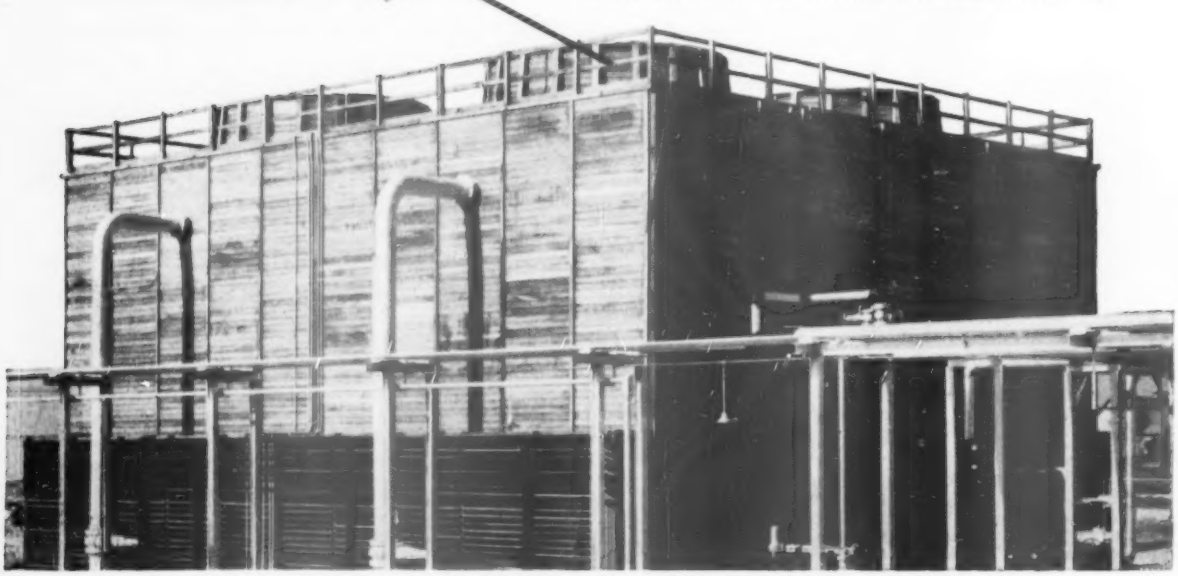
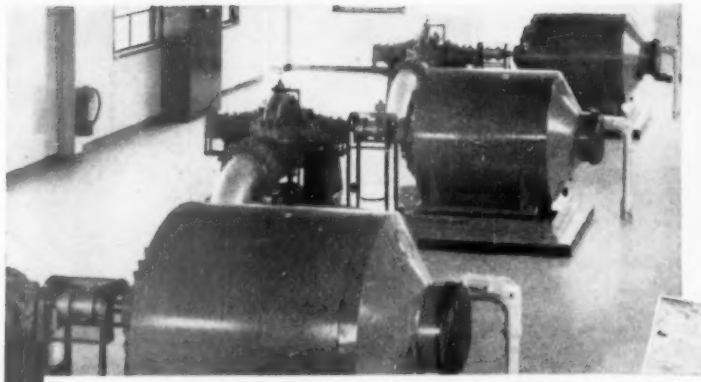
COOLING TOWERS • SPECIALIZED HEAT EXCHANGERS • GAS & AIR TREATING EQUIPMENT • CONSTRUCTION & PROCESSING FACILITIES



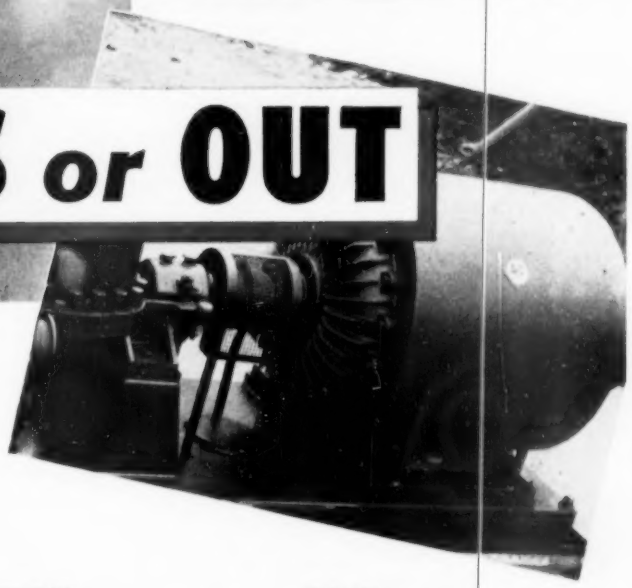


ALLIS-CHALMERS

Underwriters' Laboratories, Inc.
INSPECTED
ELECTRIC MOTOR FOR HAZARDOUS LOCATION
ELEC CLASS I GROUP D AND
10152 CLASS II GROUP F&G NO. [redacted]

MOTORS

INDOORS or OUT



DIRT and CORROSION

Can't Hurt These Motors

Here is an explosion-proof type of motor that will solve many of your dirt and corrosion problems. Install anywhere, indoors or out.

Cooling System is Self-cleaning

Cooling air is carried through the heat-exchanger tubes with sufficient velocity to expel practically any kind of dirt. If oily or sticky dirt should cling, tubes can be ramrodded clean in a few minutes because tubes are straight and tube ends are exposed.

Choice of Corrosion-resistant Materials

You can lick corrosion with this motor, too. Tubes are available in a variety of materials to meet practically any corrosive atmospheric condition. Allis-Chalmers tube-type motors have long and successful experience in such difficult applications as caustic plants, refineries and petrochemical plants, power plants with fly ash problems and many others.

Next time you need a motor for a dirty or corrosive location or for outdoor operation in all kinds of weather, call your Allis-Chalmers District Office. Get complete information on Allis-Chalmers tube-type totally-enclosed, fan-cooled and explosion-proof motors. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 51B7149. Available in ratings on frames larger than NEMA 505 up to 3000 hp. (Not all UL approved) A-4223

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Distributors, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components or complete control systems.

TEXROPE V-belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

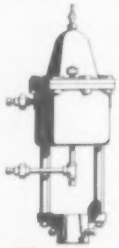
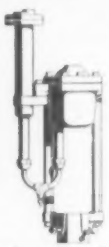
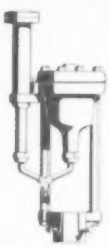
PUMPS — Integral types from ¾ in. to 72 in. discharge and up.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

What's worth metering is worth metering right!

. . . and Foxboro offers the *right* meter for any metering problem. Round and rectangular cases. See the varied types below.

TYPE 22 Meter Body	TYPE 29	TYPE 27 Meter Body	TYPE 28 Meter Body	TYPE 26 Meter Body
				
light weight and low cost, preferred for portable recording, or with 6" indicator, for mounting directly on piping.	for differential ranges as low as 1" H_2O, especially for low pressure gas and air service.	superior general use meter with all Foxboro design features for high sustained accuracy and maintenance-freedom.	longer float travel, greater power, highest accuracy meter ever built.	leakproof measurement at really *high* pressures without compromise in accuracy.

a flow meter type for every need

From its complete line of flow meters, Foxboro can offer the *best* type — in the proper range and static pressure rating — for virtually any metering problem. They are available as indicators, recorders, controllers, and transmitters — with or without integrator. Foxboro also is the maker of the d/p Cell — the compact force-balance type flow transmitter which uses no mercury.

The widest selection of flow instruments is only one of the many factors responsible for Foxboro's acknowledged leadership in flow metering. See how this factor — together with many superior, exclusive design features — give you the most value for your money. Write for Bulletin 460 on mercury meters, Bulletin 420-1 in d/p Cells.

Specifications of Foxboro Meter Types Illustrated

TYPE	MATERIAL	MAX. W. P.	RANGES
22	Forged Steel	2000	20"—200"
29	Cast Iron	150	1" —10"
27*	Forged Steel	2000	10"—400"
28	Forged Steel	2000	50"—400"
26	Forged Steel	5000	100"—400"
d/p Cell	316 S.S.	750-4000	25"—800"

*Type 27U is a uniform flow scale meter used for steam and other service where demand fluctuates widely. 100" range. Max. W. P. 2000 psi.

THE FOXBORO COMPANY, 601 NEPONSET AVENUE, FOXBORO, MASS., U.S.A.

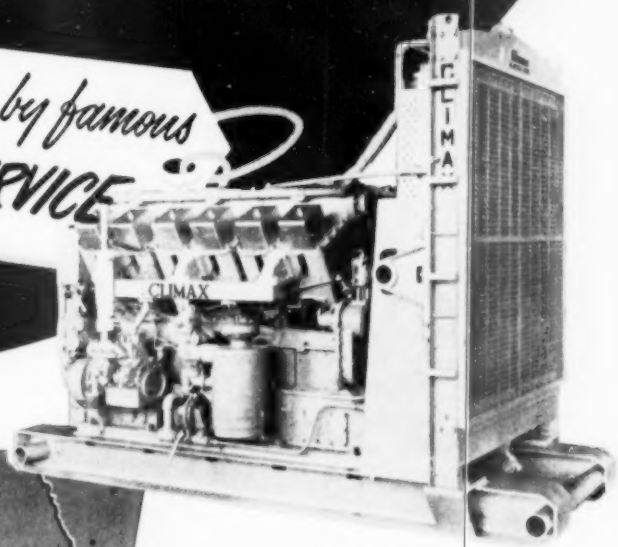
FOXBORO REG. U.S. PAT. OFF. FLOW METERS

FACTORIES IN THE UNITED STATES, CANADA, AND ENGLAND

LARGE.. MEDIUM.. or SMALL

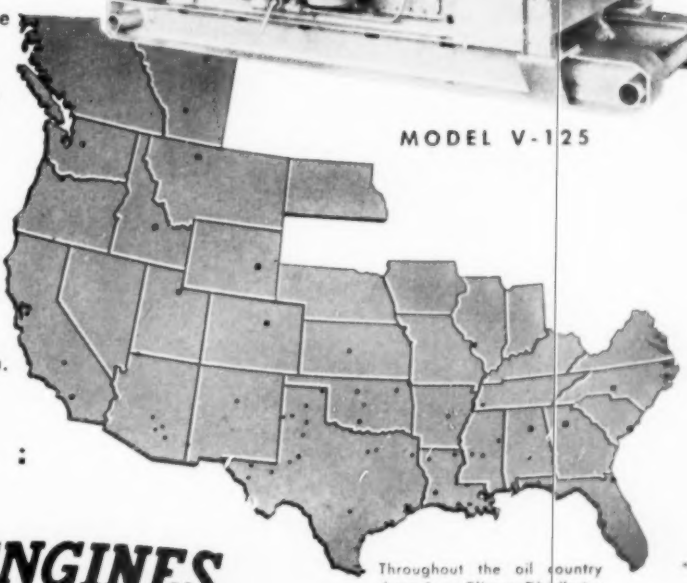
climax MAKES THEM ALL

. and all backed up by famous
BLUE STREAK SERVICE



MODEL V-125

Yes, for every oil field requirement there is a Climax Blue Streak Engine to furnish smooth, dependable power. In fact there are seven modern models with power ranges from 110 to 530 horsepower . . . each designed to operate with equal efficiency on either Butane or Natural Gas.
And when service is required you are assured of unsurpassed attention from your nearby Climax Distributor. He maintains a complete stock of parts and repair facilities as well as a staff of experienced, factory trained mechanics who are anxious to serve you.

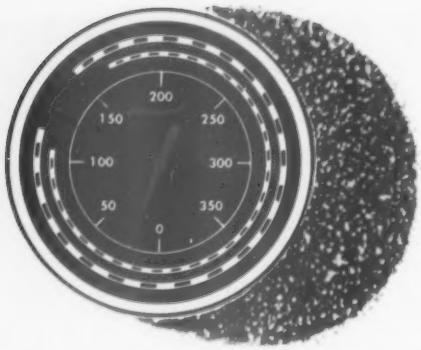


Throughout the oil country there is a Climax Distributor strategically located to reach your operation within two hours with famous Blue Streak Service.

climax

BLUE STREAK ENGINES

Made by CLIMAX ENGINE AND PUMP MFG. CO. Factory and General Offices: Clinton, Iowa. Oil Field Sales Office: 155 Continental Ave., Dallas, Texas.



20,000 POUNDS OPEN TESTER IN 2 MINUTES

HALLIBURTON'S NEW HYDRO-SPRING TESTER

No more dropping bar, rotating pipe, turning J-slots . . . Hydro-Spring opens easily, positively, simply by slacking off weight of drill pipe. Tools are calibrated to open in 2 minutes with 20,000 pounds or 3 minutes with 30,000 pounds. This time interval prevents premature opening and permits accurate reading of initial hydrostatic mud weight.

Definite Surface Indication When Tool Opens

There's no question about when Hydro-Spring opens. A definite movement of weight indicator needle and a slight jar of drill pipe give positive indication at surface that tool is open.

These are major improvements in well testing, and Hydro-Spring offers even more advantages: It has performed over 10,000 tests with less misruns due to mechanical failure, saving much time, trouble, and money. Its locked open by-pass aids in easy, rapid descent of string even in tight holes, and helps eliminate formation damage; It permits reversing off bottom simultaneously with taking closed-in pressure; It can be rotated coming out of hole.

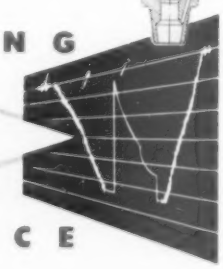
All Halliburton divisions now have this miracle tool of modern testing. Besides Hydro-Spring you get the Bourdon Tube Pressure Recording Device, the personal attention of a responsible operator, the utmost convenience of minutes away service, and many other things that make Halliburton best for your drill stem test.

Phone your local or district Halliburton office. Or contact Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

TESTING

HALLIBURTON

SERVICE



Hydro-Spring Tester — Patent Applied For

HALLIBURTON'S BEST FOR YOUR DRILL STEM TEST

We're mighty interested in the new baby

Each time a new model car is announced, the manufacturer who produced it is as proud as a new papa. And refiners, too, are interested, because they have vital interest in keeping these new babies running just as they left the showroom.

What will be the fuel or lubricant requirements of the new arrival? What are its octane requirements, and what will they be as it grows older?

To help answer these questions, whenever it appears that a new car will have a new or modified engine, the Ethyl Research Laboratories in Detroit obtain several of the early production models for test purposes.

They are carefully given a recommended break-in, then road-tested for octane requirement as clean engines. Additional mileage is then accumulated in order

(Continued on next page)

ETHYL

ETHYL CORPORATION

Printed in U.S.A.

We're mighty interested in the new baby

(*Continued from preceding page*)

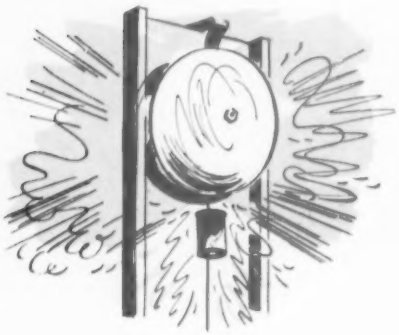
to measure changes in this requirement as the car grows older.

Not only do we test these new cars ourselves in cooperation with the manufacturers, but we make them available to refiners who want to test their own products in them.

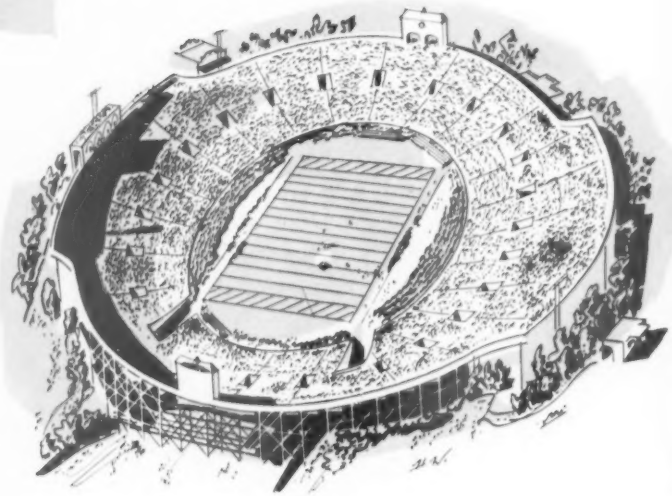
This new-car-requirement program is only a small part of the research activity Ethyl carries on in serving the petroleum industry. But it is of such direct and understandable benefit that we like to point to it as an example of the many services you get when you buy "Ethyl" antiknock compound.

ETHYL CORPORATION
NEW YORK 17, NEW YORK

WORTH NOTING



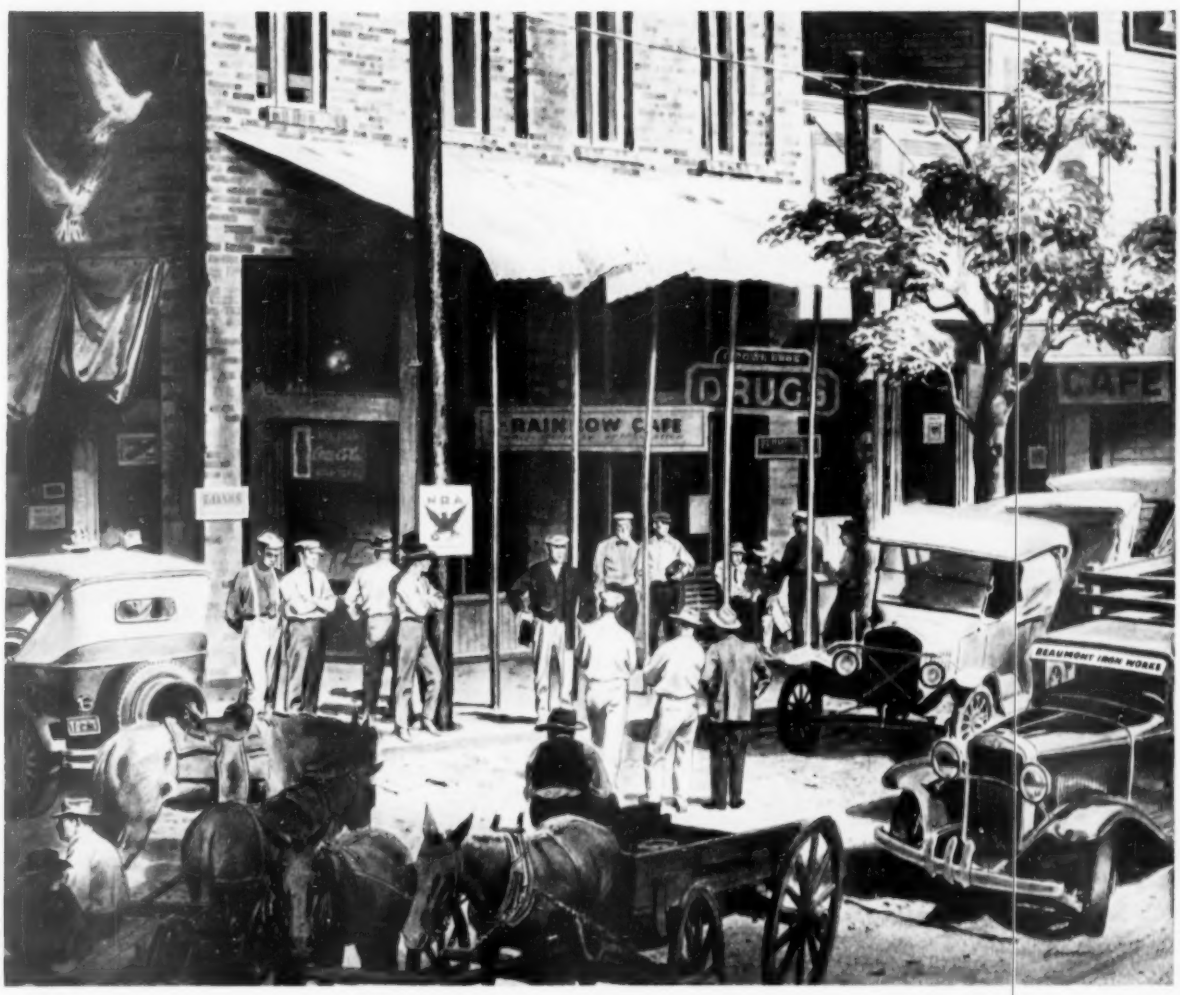
Ethyl's national advertisements promoting your best gasoline are consistently among the best-read advertisements in the magazines in which they appear!



The Rose Bowl in Pasadena, California, will seat 89,090 spectators. Just *one* of the weekly audiences last year for Ethyl's TV commercials promoting your best gasoline would fill 47 Rose Bowls!

The gasoline used last year by Ethyl for test purposes alone would run a Greyhound bus 103 times around the world!

Ethyl Service is backed by 30 years of antiknock experience



IN THE EAST TEXAS FIELD-WE DID OUR PART TOO

In the oil boom towns of East Texas in the Thirties, men made deals, scrambled after leases, and the storekeepers put up their Blue Eagles. And in the new oil fields, we at Beaumont Iron Works did our part, too. For BIW well head equipment was the overwhelming choice of oil men in East Texas.

Engineered and designed to do the job right and to do it for the years, you can see today in East Texas the toughness and long life built into all BIW equipment. Today, at the ***new*** Beaumont Iron Works Co., you'll find that the same toughness is engineered into BIW products. Built to do its job right, BIW equipment in drilling and production is still built for the years ahead — built to do its job right and built to justify your faith in this, one of the oldest companies in the oil fields.

BIW

BEAUMONT IRON WORKS
BEAUMONT, TEXAS
Subsidiary of American Locomotive Co.
General Sales Office: 1404 Dunlavy St.,
Houston 19, Texas
Warehouses in Beaumont and Odessa

ANOTHER LEADING OIL PRODUCING AREA WHICH HAS DEPENDED ON BIW EQUIPMENT.

In South Texas...

LOW TEMPERATURE BS&B SEPARATION

COLD-FRAC* SYSTEM

Does An Outstanding Job For Lease Operator!

AN ACTUAL CASE HISTORY FROM OUR FILES:

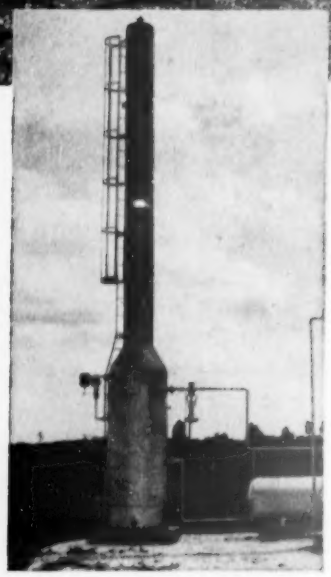
PROBLEM: This Texas operator‡ had new gas wells with a production capacity in excess of 15 MMSCFD, at a flowing pressure of 2,000 p.s.i. gauge. Maximum dehydration and condensate recovery were desired before delivery to the pipeline at a pressure of 760 p.s.i.

SOLUTION: A BS&B "COLD-FRAC"* System with Hydrate Inhibitor was selected and installed because of its superior recovery rate over Conventional Stage Separation and Conventional LTS Units. The Hydrate Inhibitor would also perform the dehydration necessary to meet pipeline requirements, and to prevent hydrate formations at separator temperatures of approximately +3° F.

RESULT: This unit is now recovering condensate at the rate of approximately 13.5 bbls./MMSCF, and sales gas is going into the pipeline at a dew point of —15° F. A practical solution to this lease operator's problem!

*"COLD-FRAC" is a trade-mark of Black, Sivalls & Bryson, Inc. (Patented and patents applied for.)

‡ Name supplied on request.



Further Increased Recovery Possible With A BS&B "COLD-FRAC"* Stabilizer

which is normally installed as a part of the BS&B "COLD-FRAC"* System. Can also be purchased as a separate packaged unit. It offers a means of holding the added recovery made possible by the BS&B "COLD-FRAC"* System. If your separator system is making 50 or more barrels of condensate per day, you should investigate the BS&B "COLD-FRAC"* Stabilizer!

THERE IS A TYPE OF "COLD-FRAC"* SYSTEM for every field requirement the operator may encounter. Ask your BS&B Man . . or write directly to . .

EFFICIENCY BS&B RELIABILITY OVER 60 YEARS

BLACK, SIVALLS & BRYSON, INC.

Oil & Gas Equipment Division, Dept. 1-A1

1708 West Main Street — Oklahoma City, Oklahoma

They Say—

Industry Constantly Making Gains

"The petroleum business has made tremendous strides in improving its product and in the development of new fields and new markets. It has made progress through its own efforts and because it determined many years ago that it would remain independent, that it would solve its own problems and that it would always and in every direction try to give better service to its customers."

Secretary of Interior Douglas McKay delivering the dedicatory address at the new petroleum research center, Lafayette, La.

U. S. Needs Venezuelan Oil

"In the last 4 years Venezuela has purchased in the United States $2.014 billions' worth of American goods. This sizable figure represents about 72 per cent of the total purchases of Venezuela in foreign countries.

". . . but in the same period the United States bought from Venezuela only about 39 per cent of our total yearly exports. This means that the trade balance between the two countries is definitely in favor of the United States and that, even if the purchases of Venezuelan oil are 'excessive'—which they are not—the United States is at the winning end of the bargain when it agrees to take part of our production in order that we may in turn buy much more from American manufacturers.

"There are other intangible factors connected with the production of Venezuelan oil that benefit the economy of the United States: the dividends American stockholders receive on investments in Venezuela and salaries received by American executives, technicians, and employes on the payroll of the Venezuelan oil companies.

"There is also, of course, the international goodwill factor, which should be priceless in itself.

"Venezuela is vitally concerned with the debate on foreign oil. It could not be otherwise, since our national economy and our prosperity depend on our oil sales. Fortunately, the prosperity of other countries means prosperity for the United States. In this light, we are confident that clear thinking will eventually prevail."

Delfin Enrique Paez, Consul Gen-

Here's proof!

ONLY JOHNSTON OFFERS

ALL THESE FEATURES

AT NO EXTRA COST!

TURBINE PUMP SPECIAL FEATURES—OIL LUBRICATED ENCLOSED IMPELLERS

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PUMP "B"				PART OF IMPELLER	YES	YES			YES	YES	
PUMP "C"	EXTRA CHARGE	EXTRA CHARGE		YES	YES	YES	YES	EXTRA CHARGE	EXTRA CHARGE	EXTRA CHARGE	YES
PUMP "D"	EXTRA CHARGE	REPAIRS ONLY				YES		EXTRA CHARGE	YES	YES	
PUMP "E"	EXTRA CHARGE	END SEAL YES	YES	YES	YES	YES	YES	YES	YES	YES	
PUMP "F"	EXTRA CHARGE	EXTRA CHARGE		YES	YES		YES	EXTRA CHARGE	EXTRA CHARGE	EXTRA CHARGE	
PUMP "G"				SO CALLED SEAL	YES	YES		YES	YES		
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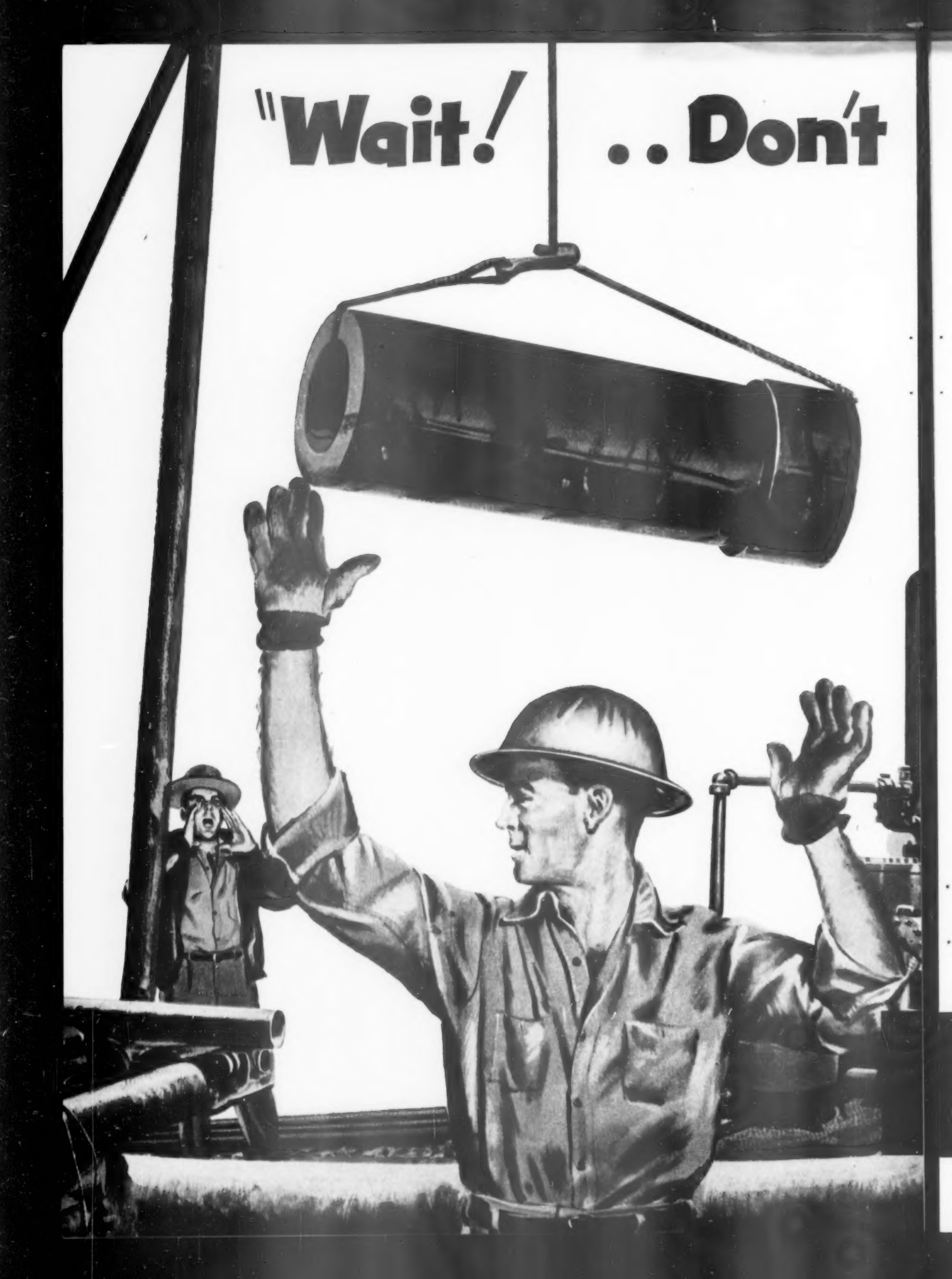
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eral of Venezuela, in a letter to the editor of the New York Times.

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"In the Grand River area we have the seedling for a similar industrial expansion in Oklahoma. You cannot build an industrial state by ballyhoo. But you can build it by finding out what it can produce more efficiently than other states and selling the unadorned facts."

Editorial in the Tulsa Tribune.

Recession Talk Dangerous

"Now we have gained peace . . . federal controls over the economy have been removed, and the dollar has become stable again. The time would seem to be at hand for America to step out buoyantly toward the new goals that peace and a free economy make possible.

"But what is happening? We have finally got what we wanted all these years, only to hear good Americans . . . talking balefully about a recession. Theirs is a chorus into which too many Americans already have joined.

"The past decade has been a fateful one for America, but the next 10 years will be this nation's time of epic decision. What the American people think, say, and do will largely determine not only our own destiny, but the course the whole world must take."

Paul G. Hoffman in an article entitled "How to Avoid a Psycho-Recession," in the New York Times Magazine.

Smog Top Problem for Industry

"I think that we of industrial management should consider polluted air one of our top-priority problems.

"However, while industry is only partially to blame, it seems clear that we must take the lead in cleaning up; must not only get our own house in order but lend help to others to clear the skies.

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William L. Stewart, Jr., executive vice president of Union Oil Co. of California, addressing the annual Industrial Health Conference, Houston.

CALENDAR OF EVENTS

JANUARY

11-15 Society of Automotive Engineers, annual meeting and engineering display, Sheraton-Cadillac and Statler Hotels, Detroit.

12-14 National Constructors Association, annual meeting, Hotel Commodore, New York City.

18-20 Pipe Line Contractors Association, sixth annual convention, Shamrock Hotel, Houston.

18-22 American Institute of Electrical Engineers, winter general meeting, Hotel Statler and Hotel McAlpin.

25-28 Plant Maintenance & Engineering Conference, Hotel Conrad Hilton, Chicago.

27-29 Ninth annual symposium, "Instrumentation for the Process Industries," Texas A. & M. College, College Station, Tex.

25-28 Plant Maintenance & Engineering Show, International Amphitheatre, Chicago.

FEBRUARY

1-5 National Association of Corrosion Engineers, annual short course in corrosion, Washington State College, Pullman, Wash.

4 Instrument Society of America, ninth annual regional conference, Hotel Statler, New York City.

11-12 Western Petroleum Refiners Association, regional meeting, Hotel Beaumont, Beaumont, Tex.

22 American Association of Petroleum Geologists, Rocky Mountain section, annual meeting, Albuquerque, N. M.

26 Natural Gasoline Association of America, Permian Basin regional meeting, Lincoln Hotel, Odessa, Tex.

MARCH

1- 5 American Society for Testing Materials, spring meeting, Shoreham Hotel, Washington, D. C.

3- 5 American Petroleum Institute, Division of Production, Southwestern district, Rice Hotel, Houston.

4- 5 American Gas Association, transmission and storage conference, Jung Hotel, New Orleans.

8-10 American Institute of Chemical Engineers, Statler Hotel, Washington.

15-19 National Association of Corrosion Engineers, annual meeting, Municipal Auditorium, Kansas City, Mo.

17-19 American Petroleum Institute, Division of Production, Mid-Continent district, Biltmore Hotel, Oklahoma City.

23-April 1 American Chemical Society, an-

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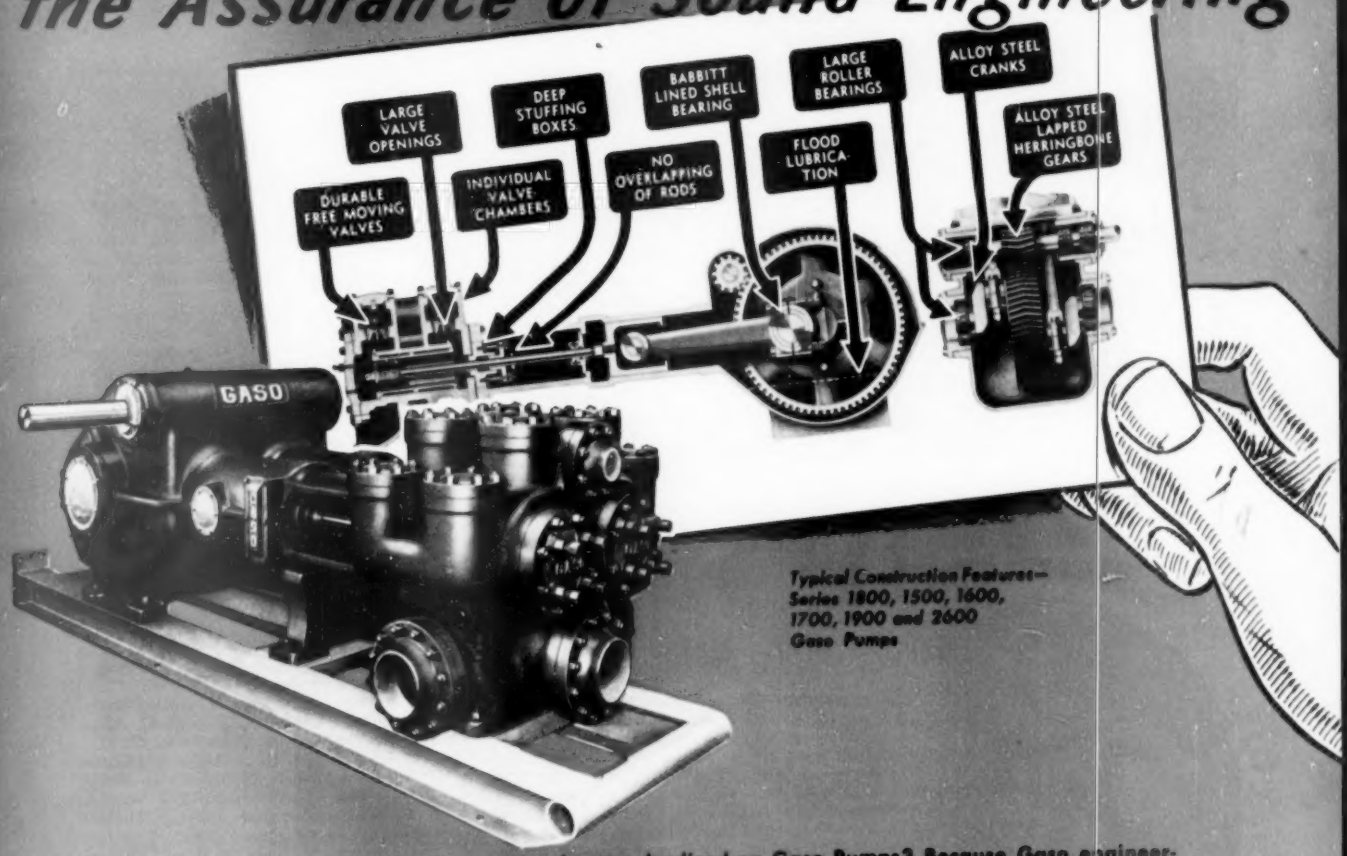

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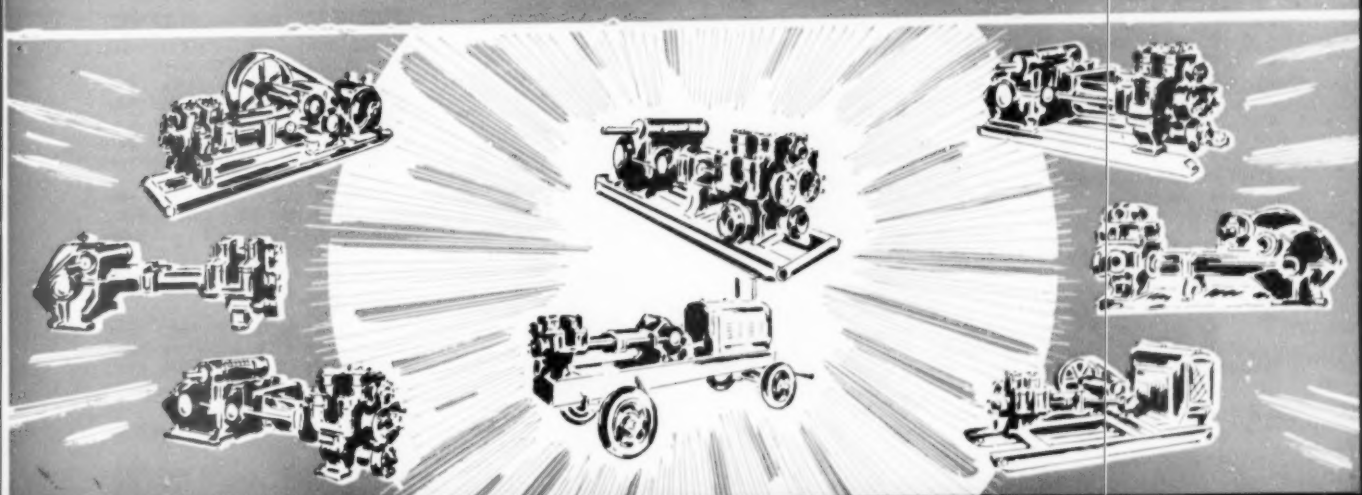

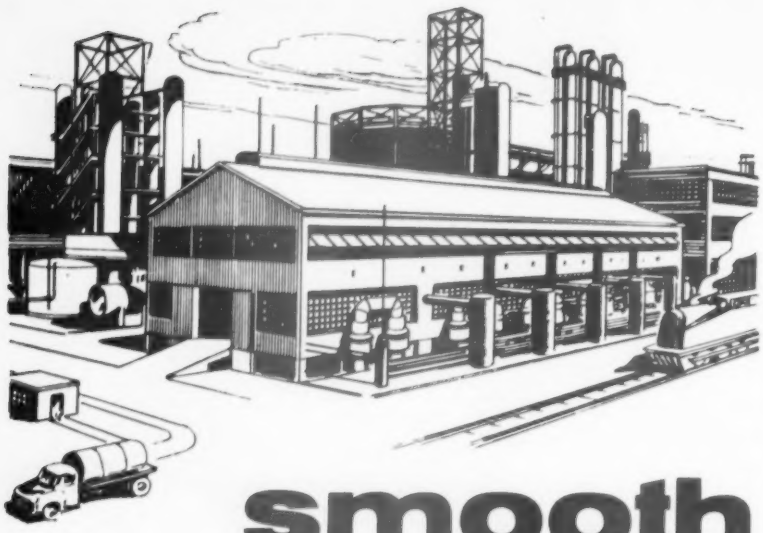

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nual meeting, Municipal Auditorium, Kansas City, Mo.

29-31 Western Petroleum Refiners Association, annual meeting, Plaza Hotel, San Antonio, Tex.

APRIL

4- 6 Texas Independent Producers and Royalty Owners Association, Rice Hotel, Houston.

5- 7 American Society of Lubrication Engineers, Netherland-Plaza Hotel, Cincinnati.

6- 8 Petroleum Industry Electrical Association, annual convention and exhibit, Adolphus and Baker Hotels, Dallas.

8- 9 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Townsend Hotel, Casper, Wyo.

12-16 American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, and Society of Exploration Geophysicists, annual meeting, St. Louis.

13-15 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, Okla.

14-16 National Petroleum Association, fifty-first semiannual meeting, Cleveland Hotel, Cleveland.

21-23 Natural Gasoline Association of America, thirty-third annual convention, Baker Hotel, Dallas.

26-28 Southern Gas Association, annual convention, Houston.

MAY

2- 4 Independent Petroleum Association of America, midyear meeting, Cosmopolitan Hotel, Denver.

3- 5 American Geophysical Union, thirty-fifth annual meeting, National Academy of Sciences, Washington, D. C.

6- 7 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Statler Hotel, Los Angeles.

10-12 American Petroleum Institute, Division of Transportation, Products Pipe Line Conference, Warwick Hotel, Philadelphia.

10-13 American Petroleum Institute, Division of Refining, midyear meeting, Rice Hotel, Houston.

17-19 American Petroleum Institute, Division of Marketing, midyear meeting, Cosmopolitan Hotel, Denver.

24-26 American Gas Association, production and chemical conference, William Penn Hotel, Pittsburgh.

27-28 Natural Gas and Petroleum Association of Canada, Prince Albert Hotel, Windsor, Ont., Canada.

31-June 5 American Petroleum Institute, Division of Production, midyear committee conference, St. Francis Hotel, San Francisco.

JUNE

3- 4 Pennsylvania Grade Crude Oil Association, thirty-first annual meeting, Hotel William Penn, Pittsburgh.

6-11 Society of Automotive Engineers, summer meeting, Ambassador and Ritz-Carlton Hotels, Atlantic City, N. J.

13-18 American Society for Testing Materials, annual meeting and exhibits, Sherman Hotel, Chicago.

17-19 American Petroleum Institute, Division of Production, eastern district meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.

20-24 Canadian Gas Association, Banff Springs Hotel, Banff, Alta., Canada.

27

July 1 Petroleum Equipment Suppliers Association, nineteenth annual meeting, Manoir Richelieu, Murray Bay, Que., Canada.

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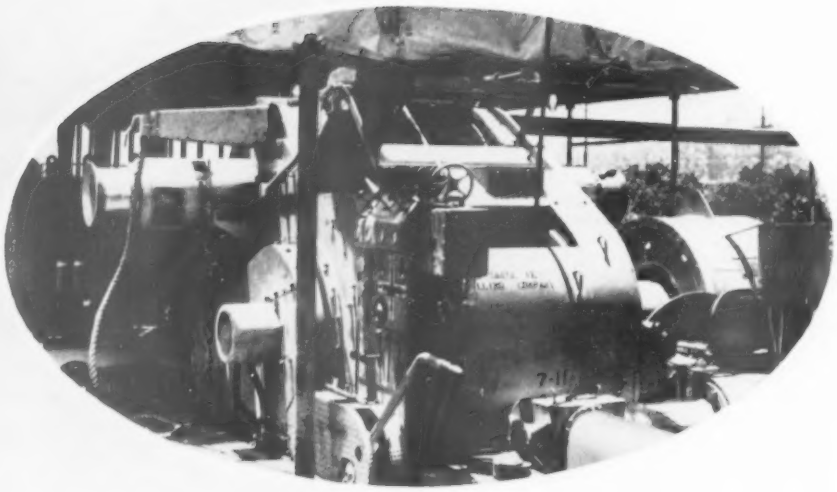

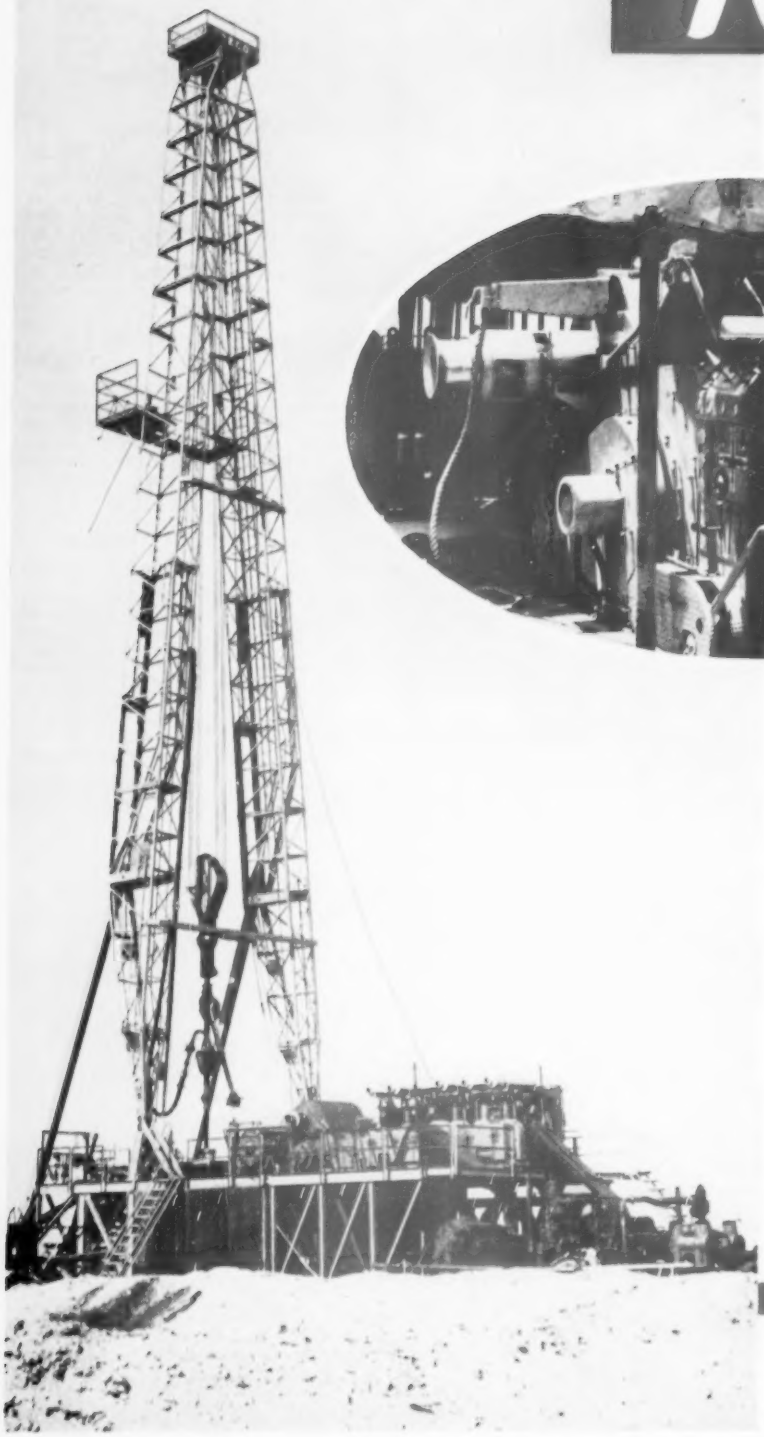

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JOURNALLY Speaking

Essential Dynamism

LAST month in Washington there was a super-duper powwow by an outfit calling itself the Mid-Century Conference on Resources for the Future, Inc., at which, as we understand it, several hundred college professors and double-domed global thinkers undertook to determine such things as when we are going to run out of oil and what we ought to do about it.

Being disappointed at not seeing any reports of the outcome of such a vital confab, we asked Bert Linz, our ever-alert Washington editor, how come neither he nor any of the newspapers had much to say about it. Without comment, Bert sent us a copy of the press release summarizing the deliberations and conclusions of the sessions on energy-resource problems, from which we quote, in part:

"The complex interrelationship of economics and technology was implicit constantly in the discussions. Emphasis was placed again and again, whether in consideration of the mining of coal from 30-in. seams or in debate on the possible use of thorium as a substitute for uranium in breeder reactors, on the essential dynamism of the problem of utilization of energy resources, whether those resources were 'ultimate' figures based on geological inference or 'inventory' figures based on current oil-extraction practice.

"This dynamism, it was obvious, was the result of an inescapable tension between a fleetingly existing economic situation and the possibility that technological advance could and would bring into use hitherto inaccessible reserves, or render applicable hitherto merely theoretical practices, thus altering the price basis and the relationship of supply and demand . . .

"In the discussions concerned with conservation and wise use of our energy resources, the theme of technological advance, then economic fixity, then new technological advance, then new economic fixity was heard again. There was consideration of ways to encourage exploration and greater production of mineral fuels. . . The development and exploitation of additional fossil fuels—oil shales especially—as a way to assure the conservation of other resources was seen as warranting support from federal Government in sponsoring of research. This advocacy of government's speeding possible later economic advance again reflected the necessity for technological shifts to be at least hinted at before economic dependability could be expected."

There was more of the same, but that's enough to explain why this sort of "eggheadery" didn't get much play in the public prints.

It's been a long time since we studied economics in college so we're a little rusty on this erudite gobbledegook, but as we decipher this "press release" the conference concluded that:

Whenever it looks as though we may run short of oil (inescapable tension), people will get busy (essential dynamism) and do something (technological advance) to prevent a shortage (economic fixity), but that it would be wise to do some research (the necessity for technological shifts to be at least hinted at) before rushing in to start a whole new industry (economic dependability).

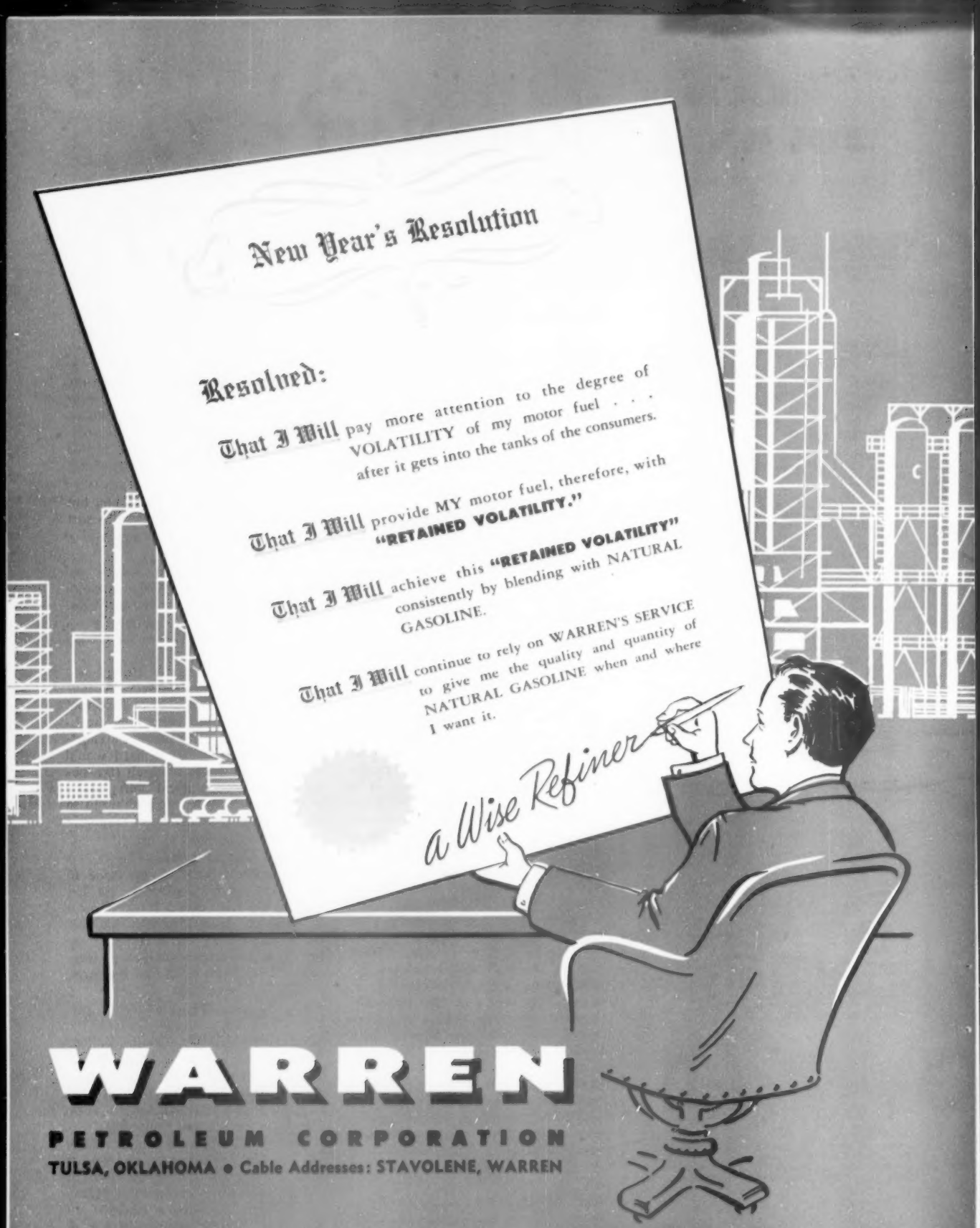
That's nice to know. The oil industry owes a debt of gratitude to the Mid-Century Conference on Resources for the Future, Inc., for such a succinct demonstration that we won't run out of oil so long as we have essential dynamism—more commonly known as individual initiative.

Geography Text

PENNSYLVANIA State College thinks so highly of the "World-Wide Oil Report" in our International Issue, December 21, that it has adopted it as a textbook for use in its classes in petroleum engineering.

To help the students, we sent Penn State a flock of 48-page reprints of this encyclopedic recapitulation of global petroleum development. It's a doggone good reference piece, if we do say so ourself. Anyone else want a reprint?

—Henry D. Ralph.


New Year's Resolution
Resolved:
That I Will pay more attention to the degree of VOLATILITY of my motor fuel . . . after it gets into the tanks of the consumers.
That I Will provide MY motor fuel, therefore, with "RETAINED VOLATILITY."
That I Will achieve this "RETAINED VOLATILITY" consistently by blending with NATURAL GASOLINE.
That I Will continue to rely on WARREN'S SERVICE to give me the quality and quantity of NATURAL GASOLINE when and where I want it.
a Wise Refiner

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Don't expect much from Congress this year

THE oil and gas industry can expect very little from the session of Congress which opened this week. There may be no harmful legislation, but neither will there be much that's constructive.

A year ago all industry was gratified with the inauguration of a "business-minded" administration. The results, for oil and gas, have been mixed, though undoubtedly there is spreading through the executive departments an attitude of trusting business initiative and business thinking as opposed to government regulation.

But this is an election year, with party control of the next Congress at stake. So everything Congress does will be based on political considerations. There will be a great deal of talk, but very little new legislation. Unfortunately, legislators and administrators both will think more about what makes votes than what is best for the nation.

THIS augurs ill for several measures of vital importance to petroleum, such as amendment of the Natural Gas Act to undo the damage done by the courts in giving the Federal Power Commission control over gas production, gathering, and field processing.

Such a bill, if pressed for a vote, will become a political football, with self-appointed spokesmen for consumers crying that it would permit the "oil monopoly" to gouge all users with exorbitant prices. And consumers have more votes than producers.

However much leaders of the administration may oppose extension of federal control—and not all of them seem very firm on this point—they are smarting under the "give-away" charges hurled at many of last year's actions. So the administration is not likely to go to bat for the gas industry at this session.

NOR is there much prospect of legislation curtailing oil imports—a matter of concern to many domestic producers. The administration is committed to expanding foreign trade, and will view protectionist moves with a cold eye.

Last year the President maneuvered the defeat of special tariff and quota bills by appointing a special commission to study the subject. This commission is expected to bring in either a fence-walking or a split report, leaving it to Congress to decide whether or not greater protection should be given strategic materials such as oil. In view of the political talkathon in prospect, the chances are against any significant changes in foreign-trade policies.

So it will be with other matters affecting petroleum and industry in general. Business is not back in the Washington doghouse, but neither can it expect any favors this year. And a lot of the talk in Congress is going to sound pretty antibusiness.

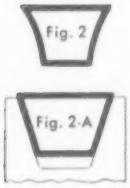
Why V-Belts with CONCAVE SIDES Last Longer!

(U.S. PAT. NO. 1813698)

Prove this yourself!

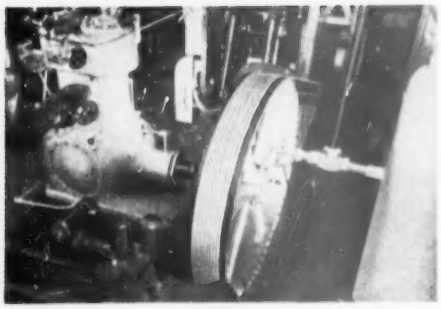
Take any *straight-sided* V-Belt (Fig. 1). Bend it—as it bends in going around a pulley. The sides will at once *bulge out* (Fig. 1-A). Clearly, those bulging sides will press *unevenly* against the V-pulley—and this causes *extra wear* at the points shown by the arrows (Fig. 1-A).

Now bend a Gates Vulco Rope with CONCAVE SIDES (Fig. 2)



Instead of *bulging*, the precisely engineered CONCAVE SIDES merely *fill out* to *fit exactly* in the sheave groove (Fig. 2-A). The sides press *evenly* against the V-pulley. All wear is distributed *uniformly* across the *full width* of the Gates Vulco Rope—and this means *longer* belt life and *lower belt costs* for you!

When you buy V-Belts, be sure to get the V-Belt with the CONCAVE Sides—the Gates Vulco Rope!



Typical Gates Vulco Rope Drive—the Gates V-Belts are built with Concave Sides to insure longer belt wear.

Gates VULCO ROPE DRIVES

REG U. S. PAT. OFF.

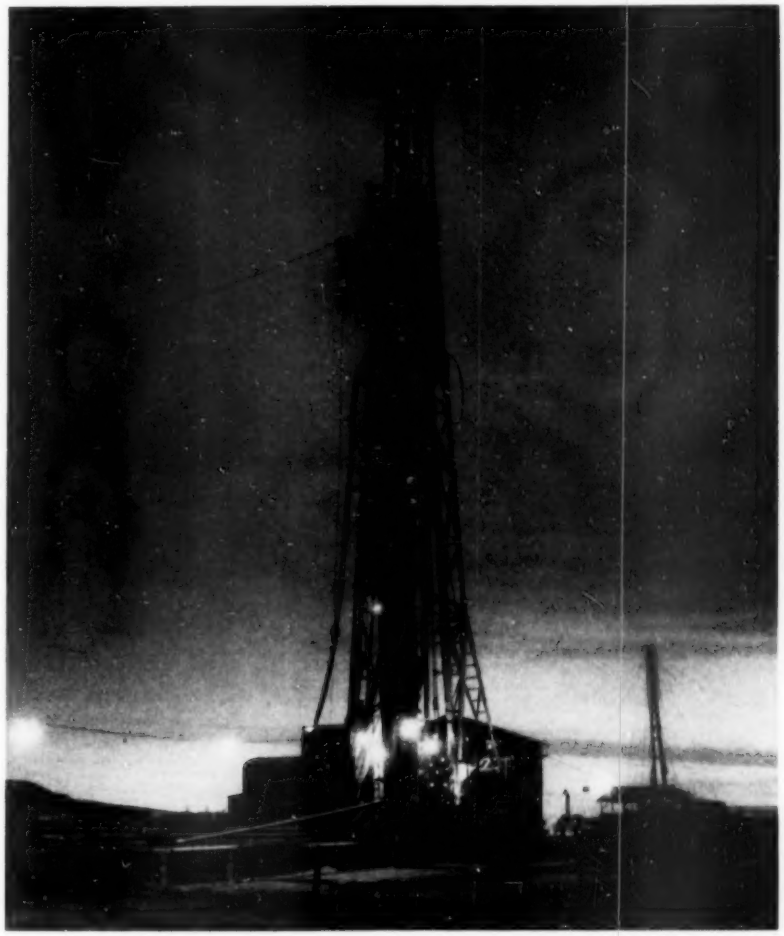
Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and in 71 foreign countries.

THE GATES RUBBER COMPANY

DENVER, U.S.A.

CS-541

THIS WEEK... ...IN THE NEWS



AN ODD SIGHT in Oklahoma's Glenn Pool is this rotary rig, the first rotary ever to rig up in the famous old field. This well, being drilled by Falcon Seaboard Drilling Co., will supply water for an experimental water-flood project soon to be started by Sinclair Oil & Gas Co. on its 160-acre Self lease. Glenn Pool, which passed its forty-eighth birthday in November, now has 1,694 wells and is producing between 5,000 and 6,000 bbl. a day. Cumulative production on January 1 was 248,000,000 bbl. The cable-tool rig in the background also is drilling for water, found at 2,700 ft. in the Arbuckle lime.

PIPE LINES—PAD's Deputy Administrator Joseph LaFortune appoints executives of six gas companies to a committee to study feasibility of a Gulf Coast-East Coast natural-gas line that could be converted to a crude carrier in a war emergency. . . . ¶Cities Service Pipe Line Co. plans a 60-mile, 12-in. extension to Houston of its 20-in. crude system from Sour Lake, Tex., to Lake Charles, La. . . . ¶Goodall Pipe Line Co.'s 45-mile, 8-in. line tapping three northeastern Colorado oil fields is placed in operation. . . . The line links Badger Creek, Little Beaver, and Middlemist fields to Sterling Pipe Line System at Merino, Colo. . . .

INTERNATIONAL—Pemex adds two branches to its products system linking the Salamanca refinery and market outlets in Central Mexico's agricultural areas. . . . The refinery is now being expanded from 30,000 to 40,000 bbl. daily capacity. . . . ¶Colombian Government approves proposal of International Petroleum Co. to build a new refinery on the Caribbean Coast. . . . ¶The first deep well ever drilled in Cuba by independents is spudded in in the island's central valley. . . . ¶New 45,000-bbl. Condor refinery near Milan in northern Italy goes on stream. . . .

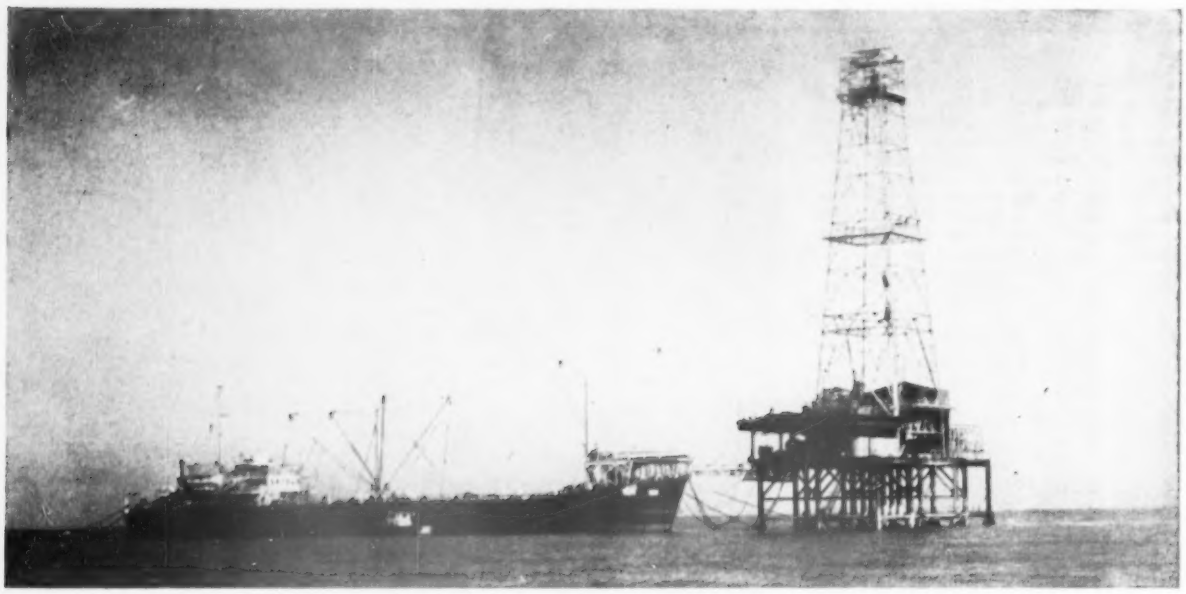
DRILLING—California Co. drilling six directional wells with one stationary rig in Louisiana Gulf. . . . Special crown block and guide-sheave assembly permits drilling of two rows of three wells each 7½ ft. apart. . . . ¶Ohio Oil Co. recovers 285 ft. of washover pipe from deep Paloma field test near Bakersfield, Calif., and prepares to resume washover operations. . . .

PRODUCTION—Powerful new truck-mounted pump used to fracture a half-dozen southern Oklahoma wells. . . . New Dowell unit employs a 500-hp. Continental Motors gasoline engine developed for Armed Services to boost injection rates. . . . ¶Union, Shell, and Dominguez Oil Field Co. prepare to kick off California's first major water-flood project in Dominguez field. . . .

NATURAL GAS—Refusal of the Supreme Court to review the Northern Natural Gas Co. case apparently gives the Federal Power Commission unlimited power to set the price of natural gas at the well head. . . . Decision bolsters the commission's authority derived from the Phillips Petroleum Co. case in November. . . . Supreme Court begins review of cases testing validity of Texas tax on "gas gathering." . . . The tax law was enacted in 1951 and $30,000,000 in payments under protest are now held in escrow pending settlement. . . .

ACTIVITY—Production of crude and lease condensate averaged 6,197,900 bbl. daily for week ended January 2, down 43,400 bbl. daily. . . . ¶Year-end reports of well completions dropped 116 wells for the week to 872. . . . Wildcat completions dropped 39 wells to 165. . . . ¶Rotary rigs operating in the United States decreased 41 rigs during week ended January 4 to 2,591 compared with 2,537 on corresponding date last year. . . .

TRENDS—Major product stocks at the end of the year were about 38,000,000 bbl. greater than at the end of 1952. . . . Gasoline was up 23,000,000 bbl. . . . Distillate gained 13,500,000 bbl. . . . Kerosine and residual increased 1,100,000 bbl. and 400,000 bbl., respectively. . . .



Novel Offshore Rig Drills . . .

Six Holes From Fixed Derrick

William P. Sterne

NEW ORLEANS.—A derrick that can drill up to six directional wells without being skidded on its offshore platform is now being used by the California Co. in Main Pass Block 69 field off the coast of Plaquemines Parish, Louisiana.

This unusual rig is only the first in a line of novel equipment being prepared by operators in cost-cutting efforts as they resume over-water drilling in the tidelands.

The Calco rig is fitted with a special crown block and guide-sheave assembly which permits drilling of two rows of three wells each. The wells are spaced 7½ ft. apart in line and the two rows are 10 ft. apart on the platform. The draw works remains stationary at all times, as does the mast.

Mounted on a specially fabricated drilling platform, this rig is Calco's answer to the problem of how to cut expenses drilling over deep water from permanent-type platforms.

The derrick is huge, 40 by 45 ft. at the base, tapering to 18 by 23 ft. at the top of its 140-ft. height, which does not include the big "gin pole."

The unique rig, which could revolutionize directional drilling procedures both offshore and from land "islands," was designed by Calco engineers working in conjunction with Lee C. Moore, Inc. It rests on a substructure which holds all necessary drilling equipment, including production facilities for the wells. The substructure was fabricated by Avondale Marine Ways, Inc., of Westwego, La.

Standard rig equipment, other than that specially designed and built by Calco and Lee C. Moore, is being furnished by Noble Drilling Co., contractor on the well.

Design and engineering saved enough in piling to pay the cost of the derrick. The platform requires only 18 pilings compared to 36 normally used for an operation this size.

Calco's converted LST, the "S-23," serves as a floating warehouse for drill pipe, bulk mud and cement and also as quarters for the crew of engineers and geologists in addition to Noble drilling personnel.

When the six wells are drilled in this one location, the platform will remain in place and serve as a production base. The rig will be lifted by derrick barges, and moved to another platform, to drill six more wells. (The location at Main Pass is about 2½ miles from the shore, over 18 ft. of water.)

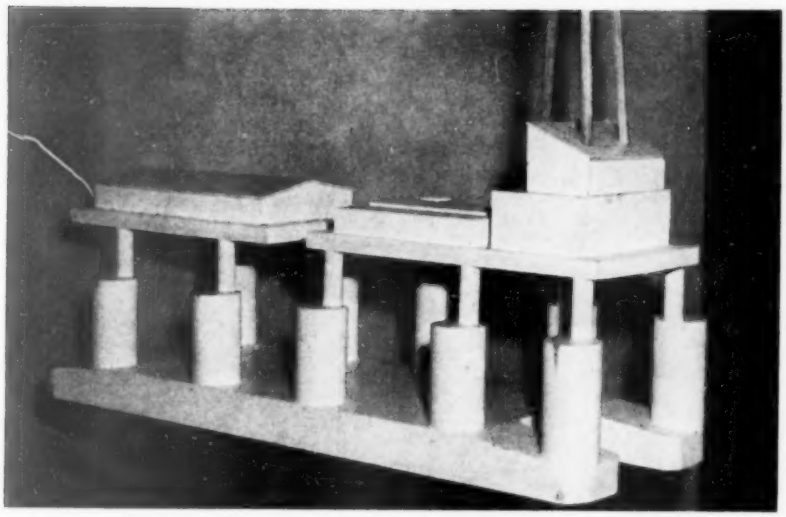
Because none of the six holes is directly in front of the draw works, a counter shaft assembly was designed to carrry power from the draw works to the rotary table. The 10-ft. counter shaft, equipped with three sprockets, is installed in front of the draw works and driven by a chain from the draw works to the center sprocket.

When the rotary table is drilling the three holes on the left of the draw works, the left sprocket on the shaft is utilized. When the rotary table is shifted to the three holes on the right of the draw works, the right sprocket is used. Chain length is varied for different positions of the rotary table.

One well to another . . . Several steps must be taken in moving from one well head to another within the same row of three wells:

. . . Crown-block assembly, mounted on trolleys and containing a hoist on the gin-pole, is unbolted and pulled 7½ ft. along the trolley-track "I" beam by comealongs, and bolted down in its new location. The crown and traveling blocks do not have to be unthreaded during such a move.

. . . On the rig floor, the rotary table is moved to its new location (the decking on the rig floor has six specially fabricated positions) and the chain



SUBMARINE ENGINE ROOM is featured in this model of Ocean Drilling & Exploration Co.'s barge which has its rig power equipment in the lower submersible hull.

drive altered to the draw works jackshaft.

. . . **The backup post** for the tongs is moved to its corresponding new prefabricated location, as are the pipe standback and monkey and finger boards in the mast at fourble level.

One row to another . . . Making a move from one row of three wells to the other row requires much the same procedure. However, the blocks have to be unthreaded, since the main crown block is moved by the comealongs, and the special two-sheave guide, with sheaves mounted at right angles, must be rotated on its axis 180° to place it in the same relative position with the regular crown block when it is over the new row of wells. The blocks must then be rethreaded, and drilling is ready to resume.

Crews can make the most difficult move—from one end of one row of wells to the opposite end of the other row—in less than 12 hours.

(Complete engineering coverage on this unique rig and its substructure will appear in next week's engineering section of The Oil and Gas Journal).

Other equipment . . . Installation of the six-well rig by Calco at Main Pass marks the first step by a major company in resumption of drilling in the Gulf of Mexico since the President signed the Submerged Lands Act 7 months ago.

Since then, oil operators have been busy designing new equipment capable of drilling in deeper waters. Other equipment, now either in existence or being built, includes:

. . . **A submersible-type barge** which sinks its own engine room to the bottom of the ocean, thus affording a substantial foundation for the unit. This barge is now undergoing final outfitting for Ocean Drilling & Exploration Co. of New Orleans, a new drilling-contractor firm, and can drill in up to 40 ft. of water. *(A complete article on this unusual design will appear in an early issue of The Journal.)*

. . . **Another submersible barge** which sinks a "jacket" or base to the bottom of the ocean by means of huge caissons. Now being built for The California Co. at a New Orleans shipyard, this barge will be capable of drilling in the deep waters around Main Pass, and is scheduled to be used by the company in this area in conjunction with the six-well rig.

. . . **A barge,** to be built for Kerr-McGee Oil Industries, Inc., of Oklahoma City, pioneer in offshore operations, for use in Gulf of Mexico waters of up to 60 ft. in depth.

. . . **Still another type barge,** already planned but not yet started, which is said to be capable of drilling in waters of up to 100 ft. in depths in winds of hurricane force. This will be similar to the barge being built for Calco, and will sink its own base by use of caissons.

Calco starts activity . . . The California Co. started the current drilling play off the Louisiana coast several months ago when it reactivated two of its LST's and announced plans to erect special drilling platforms at both Main Pass and Bay Marchand, the latter off Lafourche Parish.

Calco discovered both these fields before the tidelands controversy stopped all activity. Bay Marchand produces from flanks of the world's largest piercement-type salt dome, and the company is currently drilling 10 additional wells from a platform, with two conventional rigs.

Texas areas . . . While Louisiana has held the spotlight in offshore activity, and there has yet to be a commercial oil or gas discovery off Texas' coast, Texas tidelands are destined for major activity.

Gulf Oil Corp., successful bidder at a recent sale of state leases off Nueces County, is fabricating special offshore drilling equipment. The company plans on getting into the area, east of Mustang Island, within a few months. Gulf paid $3,065,880 for a 5,760-acre block. The sale brought in more than $32,600,000 in bonuses on 415,790 acres of tidelands leases *(The Oil and Gas Journal, December 7, 1953, page 76).*

Gulf is said to be fabricating offshore drilling platforms and tender ships, similar to the LST's which serve The California Co.'s six-well drilling rig and platform at Main Pass.

It is significant to note that operators and contractors are seeking equipment which can drill in deeper waters. Waters of 40 ft. and more are found in areas now controlled by the U. S. Government under terms of the Submerged Lands Act.

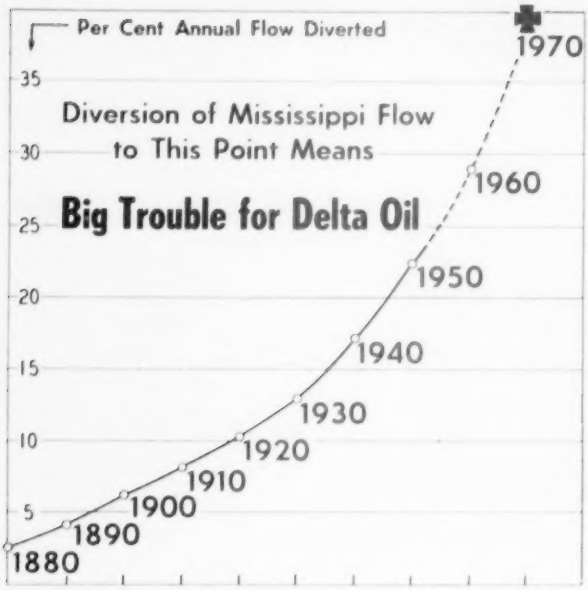
The U. S. has paramount rights beyond the 3-mile limit off Louisiana, and beyond the 3-league, or 10½-mile limit off Texas.

"Big Business" . . . Geologists believe that enormous reserves of oil and natural-gas may lie beneath the Continental Shelf. Within the strip of 10½ miles long along the Texas coast alone reserves are estimated at billions of barrels.

The petroleum industry was spending more than $60,000,000 per year off the coast of Louisiana before the tidelands controversy arose, and it was just getting started in a big way when the ownership question arose in Washington. In 1949, operators were taking 2,000,000 bbl. of oil annually from Louisiana's tidelands.

Costs high . . . Costs of over-water operations have been as much as three times those for similar operations on land. Not only is the cost of drilling wells out of proportion to wells on land, but the expense of marine transportation of the oil, transportation of crews and equipment is exceptionally high.

Therefore, any method which offers a means of getting the wells drilled and the oil to market more economically than in the past will definitely command the attention of the entire industry.



River Shift Poses Oil Problems

Gradual diversion of Mississippi's water threatens delta area's plant, pipe line, transport, production facilities

F. Lawrence Resen

NEW ORLEANS. — The petroleum industry will be faced with a unique set of problems if the Mississippi River continues its wandering ways.

Old Man River is funneling a rapidly increasing proportion of its water into a branch stream about 75 miles northwest of Baton Rouge.

This diversion of the Mississippi will reach a critical point around 1971 when 40 per cent or more of its water is drained off, according to a report made for the Mississippi River Commission under the direction of Dr. Harold N. Fisk, chief of the geological-research section of Humble Oil & Refining Co., Houston.

If this point is reached, refineries and other plants downstream will find their docks and channels silting up; New Orleans' water supply will become brackish; producing areas will be alternately flooded and silted, and access roads and bayous will become impassable.

The difficulties, while they will be felt gradually and are not insurmountable, certainly will result in sharply increased operating costs for oil companies downstream.

The situation . . . Water from the Mississippi passes westward from the diversion point through a 9-mile stream called Old River and into the Atchafalaya River *(see map)*. The rate of diversion has been increasing rapidly. From 1930 to 1940 the volume of total water diverted annually averaged 15 per cent; from 1940 to 1950, 19½ per cent; and current rate is about 25 per cent.

The principal reason for the Mississippi's changing of course to the Atchafalaya channel is the much quicker drop in elevation to sea level over the latter route, according to Fisk's report.

Water must flow approximately 320 miles down the present channel to drop from the 50-ft. elevation at the junction of the Old and Mississippi rivers to sea level at the delta. By way of the Old and Atchafalaya rivers the same drop in elevation is realized in about 120 miles.

The most obvious solution, a dam across the Old River, isn't feasible. The Atchafalaya, as well as being a navigable stream, is vitally important in flood-control operations on the lower Mississippi since it carries off huge quantities of water to the Gulf of Mexico. An ironical twist in the whole situation is that for the above reasons dredging must continue on the Atchafalaya thus making it easier for diverted water to follow this channel.

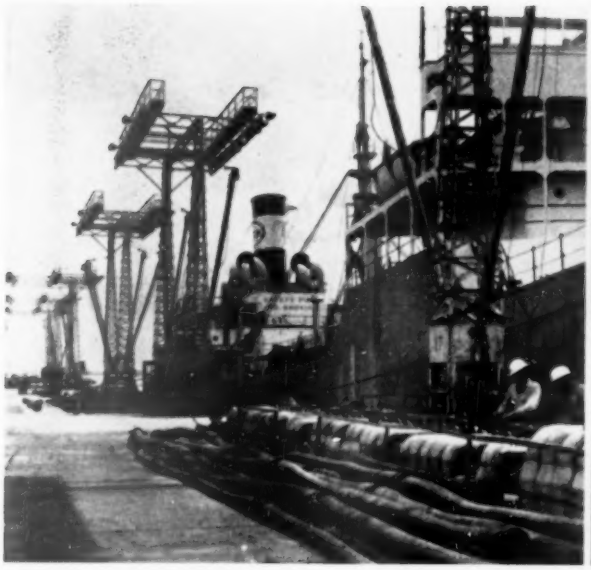
Effects . . . As more and more water is diverted from the Mississippi's present course its ability to carry its suspended load of silt to the delta region will decrease. Increasing quantities of the silt will be deposited in the river's quieter waters—on the inner side of bends and on either shore on straight runs. With the river carrying more than 1,000,000 tons of suspended sediments daily at various times throughout the year, silting of main transportation channels and docks of refineries and chemical plants along the river will reach alarming proportions.

Plants . . . A considerable number of processing plants are located immediately adjacent to the river. Their operation could be adversely affected in many ways, the foremost of which probably would be the threat of isolation from deep-water tanker traffic due to silting of channels.

At Baton Rouge is located the mammoth Esso Standard Oil Co. refinery, together with Ethyl Corp.'s main plant. Plantation Pipe Line Co. has its origin there and receives a large volume of products via tanker for transmission eastward through its system.

Farther downstream near New Orleans, where the situation will be most critical, are refineries of Shell Oil Co., Pan-Am Southern Corp., and Bay Petroleum Corp. Two new installations, American Cyanamid Co.'s petrochemical plant and Lion Oil Co.'s ammonia plant are under construction within 10 miles of the city. Numerous oil companies have loading terminals at various points along the river.

While some of the Baton Rouge plants rely on the Mississippi as a



SILTING OF MAIN CHANNELS in Mississippi below Old River is expected to become so bad by 1971 that, unless something is done, oil facilities such as this tanker-loading dock at Baton Rouge will become inaccessible to deep-water tankers.

BARGES would have to take up a lot of slack if the movement of oil on the Mississippi were to continue. In 1952 more than 3,110,500,000 lb. of cargo was loaded or unloaded by tankers at ports between Baton Rouge and the mouth of the river.

partial water supply, those in the New Orleans area are almost wholly dependent on the river for water. As a consequence of silting, all companies using Mississippi water would be confronted with an expensive filtering problem.

There also is the possibility that the New Orleans water will become brackish. Currently, a salt-water wedge from the Gulf of Mexico lies beneath the layer of river water and extends a considerable distance upstream. As the flow of water shrinks, there is less hydraulic force to hold back this salt water, thus permitting it to push upstream.

Pipe lines . . . Silt deposition also will affect a number of pipe lines which now cross the Mississippi below Old River. These lines could be buried to such an extent that, should repairs become necessary, the crossing would have to be abandoned and replaced due to prohibitive excavation costs and technical problems involved.

Diversion of waters would have just the opposite effect on lines crossing the Atchafalaya. Here, the cutting action of the river as the flow increased would wash out lines now buried at conventional depths below the river bottom. These lines would have to be relaid much deeper.

Production . . . As the Atchafalaya grows, there will be a building up of mud flats along its lower reaches. This is already occurring to a significant degree in Grand Lake.

In this area the river passes through Iberia, St. Martin, St. Mary, and Terrebone parishes, which produced more than a fifth of Louisiana's oil in 1951.

Alternate flooding and silting of this region would necessitate raising well heads, lease batteries, and other producing equipment. It would also call for much additional and expensive dredging work in order to keep open bayous over which drilling barges and other equipment are floated to well locations.

What's to be done . . . What to do about the diversion problem is under study, and there is generally conceded to be little doubt that some effort will be made to control the river. The cost of controlling but not stopping the diversion will be immense and the means complex.

The time available to do this job cannot be predicted accurately. The Fisk report estimates that the critical 40 per cent diversion point conceivably could be reached anytime between 1965-1975. Frequent large flooding could bring 40 per cent diversion much sooner than anticipated. At any rate there is a great deal to do and little time to do it.

Phillips Completes Wildcat

NEW ORLEANS.—Phillips Petroleum Co. has completed an offshore discovery well which flowed 301 bbl. a day through a small choke from one of three indicated pay zones on an 8,700-acre block in St. Bernard Parish.

The wildcat, 40 miles southeast of here, was tested in the Miocene at 5,856 ft. It had a calculated open flow of 17,500,000 cu. ft. of gas per day from another sand at 7,050 ft. and topped a third and untested sand above the completion zone.

The 1 State Lease 2220 in Eloi Bay of Chandeleur Sound is 14 miles northwest of Breton Sound where Phillips participated in the discovery of four producing fields.

Gulf Platform Permit Asked

HOUSTON.—Standard Oil Co. of Texas has asked permission from the U. S. Corps of Engineers to erect a drilling platform off Kleberg County, Texas, for operations on 19 state tracts Standard acquired in last month's Texas lease sale.

The company said it plans to build a 52-by-106-ft. platform with an elevation 38½ ft. above low tide. The derrick placed on this platform will have a top elevation of 194 ft. above mean low water.

Standard plans to connect the platform and a 48-by-260-ft. drilling tender with a foot bridge. The tender will be moored by chains to four H-beams sunk below the surface of the ocean floor at points 900 ft. from the tender.

The 19 state tracts purchased by Standard are all about 40 miles east of Kingsville and are numbered 818, 927, 928, 933, 934, 935, 936, 939, 940, 941, 945, 947, 948, 949, 951, 952, 953, and 956.

FPC Power Increased

Supreme Court's refusal to review Northern Natural case strengthens authority over gas producers and gatherers

Henry D. Ralph

THE Federal Power Commission now has apparently unlimited power to set prices of natural gas at the well head as a result of the refusal of the Supreme Court to review the case of Northern Natural Gas Co. decided by the Circuit Court of Appeals at St. Louis last July.

This latest action greatly bolsters the commission's authority over producers and gatherers of natural gas given it in the case of Phillips Petroleum Co. November 30 *(The Oil and Gas Journal, December 7, page 68).*

Taken together, the two cases seem to open the way completely for FPC to:

. . . Regulate all sales of gas ultimately moving in interstate commerce.

. . . Set aside state conservation orders which get in its way.

. . . Disregard field prices or actual value of natural gas at the well.

. . . Fix well-head prices entirely on its findings of cost of production.

Northern Natural had appealed from an FPC rate order on 10 grounds, only 2 of which are of general interest to gas producers.

One of these was allocation of costs, and the circuit court held that FPC may make its own breakdown where part of a company's operations are subject to regulation and part are not. Thus where a well produces both oil and gas, or where a plant produces both L.P.G. and pipe-line gas, FPC may determine how much of the investment and operating costs are to be allocated to the gas part of the business.

More important was the FPC refusal to accept the field price of gas as the starting point for regulating transmission charges and resale prices to distributing companies. Not only did the circuit court say that FPC need not accept field prices, but added "the commission is free from the compulsion of giving any weight to the element of value of the companies' gas at the well heads."

This undermines the hope — rather generally held by gas producers and pipe-line companies—that FPC would recognize "going" or "established" field prices and thus relieve both it and them of the necessity for determining the cost of finding and producing gas in every well.

How the dispute started . . . In the Northern Natural case the field price was 8 cents per M.c.f., in the Kansas portion of Hugoton gas field, and it had been set at 8 cents by the Kansas Corporation Commission under authority of the state's minimum-price law. The validity of this law and order had been upheld by the Kansas Supreme Court, and the validity of a similar law in Oklahoma had been upheld by the Supreme Court of the United States.

FPC did not challenge this field price as such, and did not question Northern Natural's purchases of gas at 8 cents, but it did not allow this as the price of the company's own Hugoton field production, about 13 per cent of its total supply. To determine the well-head price of Northern's own gas, the FPC applied its cost-of-production formula, which worked out to something like 5 cents per M.c.f.

The Kansas Corporation Commission joined Northern Natural in appealing to the courts, contending that the minimum-price statute is part of its conservation system because of the close relationship between price and conservation, and arguing that all gas in the same field must be treated uniformly.

In the interval since the FPC decision, Northern Natural has transferred its wells to a producing subsidiary which is selling this same gas back to it at the minimum field price (subsequently raised to 11 cents by the Kansas commission), and FPC now has pending another case against Northern Natural to determine the legality of this method of escaping regulation of field prices.

However, under the Phillips decision it would appear that neither Northern Natural's producing subsidiary nor any other producer can escape regulation. That decision directs FPC to fix the prices at which producers sell gas to interstate pipe lines.

What's involved . . . The authority given FPC under these two cases permits FPC to classify any producer or natural-gasoline plant as a "natural gas company" under the law, and then its sales, whether or not at arm's length, can be fixed on the basis of actual cost to the producer plus 6 per cent return on the investment in facilities which FPC allocates to gas production.

This seems to mean that FPC can set aside contracts under which independent producers now sell gas at prevailing field-wide prices, regardless of the minimum-price laws of Kansas and Oklahoma. Although the Supreme Court has said that these minimum-price laws are valid, their only remaining effect will be as applied to gas sold for consumption within the state of production. The FPC cost formula could result in a different price for every operator, so that the well-head price would vary from well to well throughout a single field.

A number of gas-transmission companies have producing subsidiaries, wholly or partly owned or with common stock ownership or directorates. They reasoned that FPC would not challenge the prices at which such "captive" producing companies sell gas to the transmission companies so long as the prices were the same as the "going prices" or field prices which the pipe line paid to completely independent producers.

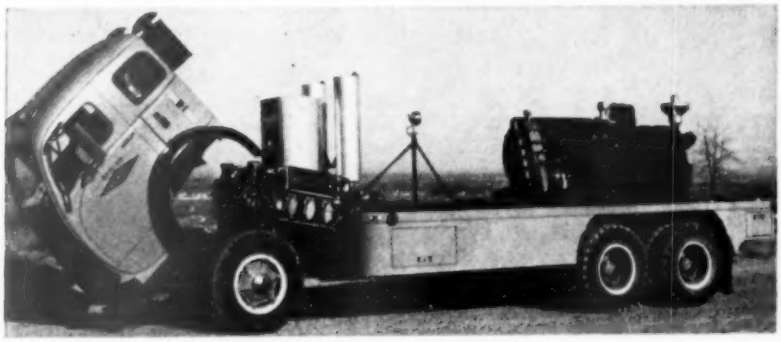
However, the court now says that once a company comes under its jurisdiction the FPC need not consider field prices but can set prices "without consideration of values of the gas in the field or at the company's well heads." If FPC can do this to gas produced directly by a pipe line under the Northern Natural case, it can also do it to gas produced by an independent under the Phillips case.

Possible escape . . . Unless Congress enacts new legislation, the only solution lies within the Federal Power Commission itself. The courts have not said that FPC must disregard field prices or must use the present cost-of-production rate formula. The methods are optional, and FPC has wide latitude in selecting the basis for fixing prices.

Thus the door is open to acceptance of field prices if the present personnel of FPC so desire. There is nothing in the law to prevent FPC from accepting prevailing field prices — whether fixed by competition or by state order —as fair and proper prices for gas at the well head, and confining its rate-fixing formula to transmission and resale of the gas.

However, when the Northern Natural case was before it, 2 years ago, the prevailing opinion in the commission was that a price of 8 cents was too high to be acceptable, even when that price was set by a state commission as a conservation measure.

SINGLE TRUCK carries 500 horsepower for pumping.



BROADSIDE VIEW shows layout of latest in fracturing equipment.

More Fracturing Power

Upsurge in hydraulic fracturing jobs follows Southern Production Co.'s lead in use of higher injection rates

Kenneth B. Barnes

HEALDTON, Okla. — Last week a series of hydraulic fracturing treatments were given a half-dozen wells in southern Oklahoma, using new truck-mounted pumping equipment with horsepower nearly doubled.

In the above photographs are pictured the new pumping unit of Dowell Incorporated, which uses an air-cooled, 500-hp. Continental Motors Corp. 6-cylinder gasoline engine as a prime mover. The engine is a new aluminum-type model recently developed for the Armed Services for light weight-high horsepower usage. The engine, of pancake-opposed piston design, is supercharged and carries two carburetors and two magnetos.

The 500-hp. engine weighs only 1,800 lb. (3.6 lb. per hp.) versus the 360-hp. V-type diesels previously used, weighing 6,000 lb. (16.7 lb. per hp.).

High injection . . . Recent innovations in hydraulic fracturing technique have been sponsored by Southern Production Co., Fort Worth, in Spraberry Trend area field, Pembrook North section, using much higher fracturing-fluid injection rates than formerly *(The Oil and Gas Journal, December 7, page 74, and December 28, page 66).*

In its Spraberry fracturing, Southern Production has had injection rates run up as high as 66 bbl. a minute for the oil-sand fracturing mixture. In production tests, the Spraberry wells have flowed 100 to 200 bbl. and more per day after treatment, compared with production before treatment of only 10 to 60 bbl. per day. The company has also performed similar injection treatments in the Blackwell, Okla., field, with similar satisfactory results. The Blackwell wells, incidentally, had been shot with nitroglycerin on original completion, and also had had previous hydraulic fracturing treatments.

Other high-injection treatments in the Spraberry by other operators indicate similar promise for the high-rate injections.

In the Spraberry Trend, from one to three or more of these high-rate jobs are now being performed daily. Better procedures are coming about as experience is gained in the big gallonage-high rate jobs.

The service companies say the oil operators can do much to expedite and improve the mechanics for such work if they:

. . . Ascertain that hole is clean to below fracturing depth and that no bridges are present.

. . . Have plenty of lease oil on hand in suitable tanks, if lease oil is to be used as fracturing fluid.

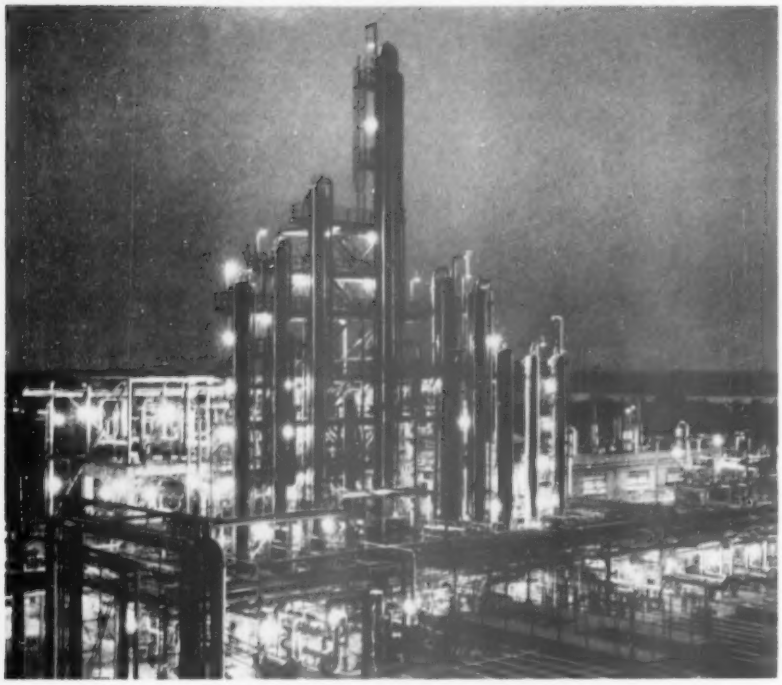
. . . Provide "plenty" of large-size suction connections to the fracturing pumping units.

. . . Schedule fracturing job ahead of time with treating company, to be sure that special multipump header *(For general design, see The Oil and Gas Journal, December 28, page 68)* is delivered to and laid out at the well a day ahead of time.

Upsurge in work . . . Hydraulic fracturing, a development of the research laboratories of Stanolind Oil & Gas Co. and patented by that concern, in its first year of application in 1949, had a total of 138 treating jobs performed. In comparison, hydraulic fracturing has now grown in popularity to such an extent that presently it is estimated that 2,500 jobs are being done per month. At the present time there have been approximately 40,000 hydraulic fracturing jobs completed.

To date, a total of 19 service companies have been licensed by Stanolind for application of the hydraulic fracturing process. These include Halliburton Oil Well Cementing Co., Dowell Incorporated, Western Co., Chemical Process Co., and other firms headquartered in Illinois, Kansas, Oklahoma, Louisiana, Texas and California.

The well shown in the treating operation above is Gulf Oil Corp.'s 3 McGill, SW SW SW 9-2s-2w, in the Graham pool 6 miles northwest of Healdton, Carter County, Oklahoma.



Unique Petrochem Plant Makes . . .

Polyethylene From Heavy Resid

. . . In First Such Industry Operation

TONAWANDA, N. Y.—A new plant which will make an estimated 20 million pounds of polyethylene a year from fuel oil-derived ethylene, has just been placed on stream here by the newly formed Semet-Solvay Petrochemical Division of Allied Chemical & Dye Corp.

The Niagara River Petrochemical Plant is something new in that growing industry. It is the first example of commercial synthesis of ethylene from any petroleum or natural gas fraction heavier than gasoline. It makes a grade of high melting point polyethylene wax which will be in demand for numerous end uses.

The starting point for the process is understood to be a heavy residual fuel oil fraction. This stream is cracked to make an oil gas in a unit designed and built by Allied's Semet-Solvay Engineering Division.

Ethylene is recovered from this oil gas in a plant designed and constructed by The Lummus Co. of New York.

Semet-Solvay Engineering designed the plant converting the ethylene into the marketed product, "A-C Polyethylene." The processes employed were originated in Allied's Central Research Laboratory at Morristown, N. J., which also collaborated with Semet-Solvay Engineering in the operation of a pilot plant at Buffalo.

The product, having a lower molecular weight than the type of polyethylene used in squeeze bottles, will provide manufacturers with a synthetic wax having a narrow range of melting point and viscosity characteristics. Incorporating lower cost, strict quality control and freedom from price fluctuations, it is expected to compete favorably with imported vegetable waxes, such as carnauba wax.

When blended with petroleum wax, it gives paper a clean, glossy appearance and greater scuff and blocking resistance, says Semet-Solvay Petrochemical. It will also find end use in emulsion-type household and automobile polishes and paste polishes. Its nontackiness, chemical resistance properties, abrasive resistant qualities and non-toxicity, say its makers, will advance its use in the making of rubber, paint, containers, textiles, electrical insulations, print ink and leather finishes.

Semet-Solvay Petrochemical Division was organized in November, 1953, to handle sales of the new plant's production.

Penn Prices Cut

Continued high production, competitive market blamed

BRADFORD, Pa.—Pennsylvania Grade crude prices dropped another 29 to 35 cents a barrel effective January 1.

The Joseph Seep Purchasing Agency of South Penn Oil Co. announced new postings for all except for Penn Grade crude from Ohio. Seep discontinued posting Ohio prices October 1, but other purchasers' prices generally followed the new prices for other Pennsylvania crudes.

Bradford district crude in both Bradford Transit Co. and National Transit Co. lines now brings $3.76 a barrel.

Middle district crude in National Transit lines brings $3.70 a barrel and Southwest district crude dropped to $3.31. Pennsylvania Grade crude from West Virginia in Eureka Pipe Line Co. lines is now $3.25 a barrel.

Both Freedom-Valvoline and Quaker State are now paying $3.24 a barrel for Ohio Pennsylvania Grade crude in Buckeye Pipe Line Co. lines.

Ashland Oil & Refining Co. cut its price for Zanesville Pennsylvania Grade crude in Buckeye lines to $2.75 a barrel, a drop of 15 cents a barrel from September prices.

The price cuts were the second since the fall of 1953 when prices on all grades of Pennsylvania crude dropped 50 cents a barrel. The current price level places Pennsylvania Grade crudes from 60 to 65 cents a barrel under ceilings during the period of price controls from January 1951 to February 1953.

The purchasing agency said further curtailment of refinery demand coupled with insufficient reduction in producing rates compelled the lowering of the market prices.

The smaller decrease in the Bradford price is due, purchasers said, to smaller pipe-line deduction and computation. The larger cut for Middle district crude narrows the cost differential of the two crudes when delivered to refineries in the same area.

The prevailing buyers' market compels delivered prices to be more competitive, the agency said.

Arvin Area Wells Sold

LOS ANGELES.—The Texas Co. has purchased the Richards and Pauly leases of Havenstrite Oil Co. and William L. Rawn, Sr., in the Arvin area of Kern County. The transaction involved nine producing wells. Purchase price was not announced.

Recorder Tested

New subsurface sonic unit records nine items of data

VENTURA. — Experimental drilling in which sound powers a percussion drill on a Shell Oil Co. well in the Ventura Avenue field has resulted in the development of a new subsurface recording instrument.

According to Ernest Black, in charge of the project, the new instrument will record up to nine different items of information at one time. No wires are required between the recorder and the surface.

The project is being carried out by the Petro-Mechanics Research Division of Borg-Warner Corp.

Black says data obtained from the recorder includes weight on the bit, mud pressure and temperature, stress on the bit, revolutions per minute and vibrations and acceleration of the bit. The instrument is installed in the drill pipe near the bit but does not interfere with mud circulation or complicate the drilling operation in any way, Black says.

The unit carries its own power supply and is shock mounted to withstand the jarring and impact loads incurred at the point of drilling. It records the drilling data on a 3½-in. strip of specially treated paper 40 ft. long. Although the instrument has proved successful in actual drilling operations, further study and testing is being continued.

The experimental sonic drilling makes use of a sound generator to set up vertical vibrations in the drill pipe. The method was developed by A. J. Bodine, Los Angeles.

Union Building to Start

LOS ANGELES. — Union Oil Co. later this month will start construction on a 14,600-bbl. Platformer at its Oleum refinery. The new unit, to be constructed by C. F. Braun & Co., will be completed late in 1954.

The new catalytic reformer is the first unit of a $40,000,000 expansion and improvement program planned by Union for the purpose of obtaining more gasoline and light products from crude oil and for producting higher octane gasolines in larger quantities.

Second unit to get under way will be a 15,750-bbl. Unifiner, also at Oleum and also to be built by Braun. This new unit, the first commercial application of the company's cobalt molybdate catalytic process for upgrading high-sulfur gasoline stocks, is scheduled for completion late this year. Feed stock will be a 45° A.P.I. gravity, 1.8 per cent sulfur gasoline.

Flood Plans Set

Dominguez flood is state's first full-scale operation

LOS ANGELES. — California's first major water flood will be launched in Dominguez field probably late this year by Union Oil Co., Shell Oil Co., and Dominguez Oil Field Co.

The project takes in about 200 acres in the East Central fault block. Faults on the east and west flanks separate the block from the remainder of the field, and production pinches out on the north and south flanks.

About 10,000 bbl. of produced brine will be injected daily into the first Callendar zone from 3,700 to 4,200 ft. The zone averages about 400 ft. thick, and about 50 per cent of it is oil sand.

A modified five-spot flood pattern is planned, using 19 wells for water injection and 15 for oil production, according to H. D. Aggers, manager of secondary-recovery operations for Union.

Approximately $1,400,000 will be spent for drilling and well-repair operations, plus an additional $350,000 for water treating and injection facilities.

Unusual arrangement . . . The project is a cooperative venture with Shell and Union separately injecting water on leases owned jointly with Dominguez Oil Field Co. Union will lay the water supply and injection lines and operate the water-treating facilities.

Of the 19 injection wells, six will be new wells. Four of them, the first of which is now in process of completion, will be along the line which divides Shell's Reyes and Union's Hellman leases. These will be utilized to create a wall of water between the two properties and thereby prevent oil migration. All but one of the 15 producers will be old wells.

The full-scale flood is the result of successful pilot tests conducted by Union over the past 7 years, during which more than 4,000,000 bbl. of water was injected. Engineering studies and appraisals were made during the past 2 years by all three companies. The program is expected to add substantially to the zone's ultimate oil production.

Choice City Leases Sought

LONG BEACH, Calif.—An unidentified oil company, working through the Los Angeles firm of Keans, Springmann & Stipek, has launched a drive to obtain leases on a triangular area comprising about 600 acres of private property within the city limits of Long Beach and adjacent to prolific production in Wilmington field.

Property owners were being offered a rental of $250 an acre annually and 25 per cent royalty.

The leasing campaign is being opposed actively by the Property Owners Oil Development Association of Long Beach. The association is urging property owners in the area to refuse to sign leases on grounds that the compensation offered is inadequate and that larger offers will come later.

It is believed that any drilling in this area would have to be done from a drilling island offshore in San Pedro Bay. It is also thought that a city permit to build such an island probably could be obtained by the holder of the town lot leases when the city launches its offshore drilling program in the bay.

Offshore Shooting Begun

LONG BEACH.—Shooting of approximately 9,600 acres of submerged lands lying offshore from the city of Long Beach in San Pedro Bay was started here last Monday. The survey, being made by Western Geophysical Co. for the city, is expected to require about 2 weeks.

First work was done at a location opposite Rainbow Pier, near present southern productive limits of the Wilmington field. Operations will move southeast to the eastern city limit near Seal Beach, and then return to the harbor district.

Washover Pipe Recovered

BAKERSFIELD.—Ohio Oil Co. has successfully recovered the 285 ft. of washover pipe from its deep Paloma field test and on January 6 was preparing to start washover operations again.

Top of the stuck 4½-in. drill pipe is at 12,016 ft. The drill pipe became frozen last October, just as the operator was preparing to pull a core which had been cut to 12,482 ft. Approximately 1,000 ft. of drill pipe had been freed when the washover pipe was stuck last November.

Defense Line Studied

PAD appoints industry group to report on feasibility of building big gas line to East for emergency oil movement

Bertram F. Linz

WASHINGTON. — A Gulf Coast-East Coast natural-gas pipe line which could be converted to crude-oil movement in the event of war is receiving serious study by the Petroleum Administration for Defense.

Executives of six gas companies have been appointed by Deputy Administrator Joseph A. LaFortune as a committee to study the feasibility of industry construction of such a line and are expected to hold their first meeting here this week.

LaFortune said that the definition of the objectives of the study and the determination of how it should be conducted will be the first concern of the group, which will consist of Walter E. Caine, vice president, Texas Eastern Transmission Co.; John H. Carson, vice president, East Ohio Gas Co.; J. J. King, vice president, Tennessee Gas Transmission Co.; A. Dale Greene, vice president, United Gas Pipe Line Co.; Walter H. Davidson, general superintendent, Transcontinental Gas Pipe Line Co., and Wilbur T. Shinholser, vice president, Columbia Gas System Service Corp.

A study of methods whereby the movement of crude from the Texas Gulf area to the East Coast could be boosted by 750,000 bbl. or more daily in the event of war was asked of PAD by the National Security Council through the Office of Defense Mobilization.

Different angle . . . A proposal that the oil industry build a 36-in. line was suggested initially last year but met with a cold reception from the National Petroleum Council when laid before it informally at its September meeting. The possibility of such a line has not been entirely dropped, however, and a number of former PAD officials have been listed as consultants to be called on for advice should the matter come up again in the future.

With an oil line apparently ruled out as not economically feasible, PAD is now canvassing the possibilities of alternatives which have been suggested—the first being a natural-gas line serving only industrial customers on a 100 per cent interruptible basis so that it would be available for immediate conversion to crude-oil service in an emergency.

LaFortune's panel of consultants will explore the possibility of interesting private industry in the construction of such a line. The study will involve a number of important factors including whether the large gas reserves which would be needed to insure the line's operation are available and whether enough of the right kind of customers could be secured to make the project feasible.

Alternatives . . . Should construction of a natural-gas pipe line prove impracticable, PAD has other alternatives it may study. Two of these already have been made known. One is the securing of rights-of-way and doing the design engineering for a line to be constructed in the event of war, plus stockpiling the necessary pipe and pumps. The other involves converting and linking existing natural-gas lines into a through oil line.

The National Security Council's interest in insuring continuity of oil supply for the East Coast in the event of war reportedly is based on military representations that in such an emergency an acute tanker situation would develop—even if there were no repetition of the situation in 1942 when tankers serving the East Coast were sunk wholesale by German submarines.

With the next war expected to be fought, as was the last, on a global basis, alternative means for transporting oil from the Gulf to the East Coast would relieve tankers which would be badly needed for trans-ocean service.

Extra incentive . . . When the idea of an industry-financed oil line was laid before the NPC last September, LaFortune admitted that under present economic conditions and oil demand it would not be an attractive proposition commercially and some "special incentive" for its construction would have to be developed. This would be beyond accelerated tax amortization, and particularly if any part of the line would have to be maintained on standby.

LaFortune made it clear that if either the oil or gas industry determined to build a line it would be entirely free to select its route, determine its size, and make all arrangements for construction, supply, and marketing.

"This is not, after all, our problem in the last analysis," he told the council. "We are supposed to be advisers on the problems of petroleum. We are not the people who make the controlling decisions."

South Dakota's First?

This is the Shell Oil Co. rig which drilled South Dakota's indicated first commercial well. The 1-A State in Harding County is 30 miles from production in Montana's Little Beaver field and about 75 miles south of the nearest production in North Dakota. Shell is still testing the 8,587-8,600-ft. interval after plugging the well back from its total depth of 9,335 ft. Pumping equipment for the well is on hand.

Kennon Asks New Boundary

WASHINGTON.—Establishment of an arbitrary boundary between state and federally-owned lands off the coast of Louisiana is being pressed by Louisiana's Governor Robert Kennon.

In Washington to discuss the proposal with Interior Department offi-

cials. Kennon said the coast line of Louisiana is so indeterminate and shifts so much that the 3-mile limit laid down by Congress is impractical.

Kennon said he is ready to submit a bill to Congress providing for a boundary based on coordinates. He said the bill also should give Louisiana and other Gulf states the same boundary limit as Texas and Western Florida.

Gas Tax Argued

Supreme Court takes up hot Texas gas-gathering issue

WASHINGTON. — Constitutionality of the Texas tax on "gas gathering" was argued before the Supreme Court last week, with attorneys for interstate pipe-line companies charging it a "violation of interstate commerce" and counsel for the state defending it as a legitimate impost.

For the state, Texas Atty. Gen. John B. Sheppard and his aide, V. V. Geppert, argued the legislature was within its rights in imposing that tax of 0.45 cent per thousand cubic feet upon the taking of residue gas at the outlets of gasoline plants for transmission out of the state.

D. H. Culton and S. A. L. Morgan, counsel for Michigan-Wisconsin Pipe Line Co. and Panhandle Eastern Pipe Line Co., argued that taking possession of gas is an integral part of a continuous process culminating in its transport out of Texas to markets in other states. A tax on any part of that process, therefore, is a tax on interstate transportation and therefore illegal under the commerce clause of the constitution, they declared.

Arguments punctured . . . State officials contended that the tax was justified as compensation for measures taken by Texas through its conservation regulations and otherwise to protect the gas supply of the pipe-line companies. Here they tangled with Justice Robert A. Jackson, who called this argument an "abstract doctrinaire" theory and said taxes do not have to be in proportion to benefits.

"I'm not sure that the gas industry gets more benefit from the Government of Texas than the Government of Texas gets from the gas industry," Jackson commented.

$30,000,000 tied up . . . The Texas tax was enacted in 1951 and would return an estimated $1,000,000 a month to the state. Because of payments under protest and the institution of suits to declare the tax invalid, receipts have been held in escrow and now amount to approximately $30,000,000. The two pipe-line companies whose appeals from an affirmative decision of the Texas Supreme Court are before the highest tribunal represent, in effect, all the 117 pipe-line carriers subject to the tax.

Imports Under Fire

I.P.A.A. says oil's future hinges more on imports than technology; Eisenhower asked to reexamine trade policies

WASHINGTON.—A three-sided attack on imports hit Washington last week.

Biggest gun in the blast was a 41-page survey on foreign trade laid before the Randall Commission on Foreign Economic Policy by Charlton H. Lyons, outgoing president of the Independent Petroleum Association of America.

In it the I.P.A.A. said the nation must take one of two courses: Rely increasingly on foreign oil with a proportionate weakening of the domestic industry, or adopt policies that will assure adequate expansion here and, at the same time, "provide for a reasonable level of oil imports."

Imports taxes or tariffs were urged in Washington by Louisiana's Gov. Robert Kennon. Testifying before the Malone subcommittee investigating the availability of oil for war, Kennon said it would be "only equitable" that imports should pay "at the gate" their share of the cost of building and maintaining our high-level economy.

In the third attack, President Eisenhower was asked by the Foreign Oil Policy Committee to make a "reexamination" of this country's whole foreign trade policy.

Committee Chairman L. Newton Thomas, president of Carbon Fuel Co., Charleston, W. V., said imports of residual fuel merit "special attention" and asked whether there has been "sufficient realization" of the danger to this nation inherent in growing dependence on foreign residual oil.

I.P.A.A. reasoning . . . The future of the productive capacity of the United States depends more on economic factors, such as the effect of oil imports, than on physical or technological limitations, the I.P.A.A., report said.

Increasing imports, produced at lower costs than domestic oil and supplying an increasing portion of the U. S. oil market, are restricting the total income from U. S. production to an increasing extent, the I.P.A.A. said.

This trend, it continued, has a direct and adverse bearing on the amount of exploration and development and, therefore, on the nation's future ability to produce oil. A continuation of existing trends would result inevitably in a productive capacity inadequate to meet national requirements.

The study showed that oil exports in 1951-52 accounted for only 5.3 per cent of the total export trade, compared with 10.9 per cent during the 5 years prior to the last war, while oil imports accounted for 6 per cent of the total import trade, compared with 2 per cent prewar.

Venezuela, the Netherland West Indies, Saudi Arabia, and Kuwait accounted for 94 per cent of all oil imports in 1952. The value of imported oil from those countries increased 62 per cent from 1948 to 1952, while exports to them of other commodities decreased 5 per cent, the report said.

"These facts pose important questions in the determination of foreign trade policies of the United States," it added. "They require an objective and thorough analysis of oil trade in general and U. S. petroleum imports in particular."

In forming foreign trade policy, it was declared, it should be recognized that "the first fundamental principle and paramount objective of national petroleum policies should be the maintenance of a healthy domestic industry, capable of supplying national requirements at all times, with a reserve capacity adequate in the event of emergency."

Government Seizes Tanker

WASHINGTON.—The Department of Justice seized another tanker last week in its drive to round up American flag vessels which have passed into the control of aliens in violation of the shipping laws.

The government moved in at Wilmington, Calif., to seize the S. S. Sweetwater, a 10,172-ton T-2 tanker registered in the name of Metro Petroleum Shipping Co., Inc. It filed suit in Los Angeles to have the ship declared the property of the United States.

So far, 36 cargo vessels and tankers sold since the war have been seized.

The Merchant Ship Sales Act of 1946 provided that surplus vessels could be sold only to citizens or citizen-controlled companies, but a number of cases have been uncovered where the citizenship of purchasers was misrepresented.

Fuels Switch Seen

Coal synthetic liquids to challenge oil, Lewis says

WASHINGTON.—Coal in the form of liquid synthetic fuel will be powering railroads and millions of automobiles by 1975, it was predicted this week by John L. Lewis, president of the United Mine Workers of America.

The prediction was made in a paper prepared by Lewis as a member of a panel of 19 guests discussing the Paley Materials Policy Commission report on a coast-to-coast broadcast on "Resources for Freedom" on television January 10.

Only "reasonable" changes in the present process for making chemicals from coal are necessary to make synthetic fuels, it was explained by Paul Alspaugh, director of the coal-hydrogenation plant of Carbide & Carbon Chemicals Co. at Institute, W. Va.

But the first step toward meeting the 100 per cent increase in the output of our total energy which he foresees in the next 25 years will have to come from the discovery of new and previously untapped oil fields and expansion of other conventional resources, it was predicted by George R. Brown, Texas industrialist.

Waste deplored . . . Correction of wasteful practices will make an important contribution to our expanding needs for energy, it was asserted by Howard Coonley, vice president of Research Corp., New York.

"We are steadily getting better on the amount of oil we leave behind when we finish with an oil field, but we must do better still," Coonley said. "We don't have a good record on natural gas; we've burned off too much of it in the fields where it's produced because once we didn't know how to do anything better. Now that gas costs more, we waste it less. The older we grow, the more we must learn to use, and the less we should have to discard."

Water will be a big problem of the future, it was warned by Abel Wolman, professor of sanitary engineering at Johns Hopkins University. Even today, he said, demand is outrunning supply. It takes 18 bbl. of water to produce a barrel of oil, 250 tons to make a ton of steel, 260 tons to make a ton of paper.

WATCHING WASHINGTON

Bertram F. Linz

How About the Atom?

Only a few years ago—the first atomic bomb was dropped in 1945—it was generally agreed that it might take 25 years or more to develop the peacetime use of atomic energy. Today, only a relaxation of government controls appears to stand in the way of industrial development—a development which will be greatly hastened if recent reports that the "bang" can be taken out of fissionable material are corroborated.

These developments are important to the oil industry, although of no immediate concern. Like synthetic liquid fuels, atomic energy is something that will come into widespread use as needed. Unlike synthetic fuels, however, there is no thought among scientists now of automobiles running forever on a teaspoonful of uranium, although, with the development of the atomic-powered submarine, research is being directed toward its possible use in airplanes.

Thinking in Washington is that while it may not take a quarter-century to develop industrial atomic energy it will be a long time before it becomes a limiting factor on the consumption of conventional fuels. It will be subject to the same factor that has postponed the development of a synthetic-fuels industry—the inability to meet economic competition—and when it does reach the point where it can compete on a price basis it is more likely merely to slow down the expansion of oil's industrial market than to cut into then-existing business.

Hot Congressional Potato

Oil imports are likely to be the subject of hot discussion in Congress this year.

Oil states whose revenues are imperiled by cutbacks in production which they attribute to the pressure of foreign oil are ready to join with the producers in a demand for some sort of restriction on imports if the situation does not improve in a matter of weeks.

The coal producers, although now less concerned over imports of residual than over the expansion of natural-gas use by utilities and other formerly large coal consumers, will willingly join the domestic oil industry in the hope of building up reciprocating support for their plan for restrictions on the end use of gas.

With the administration and a large part of Congress dead set against quotas, there is some talk that proposals for limitations on oil imports might take the shape of a flexible tariff, under which rates are graduated upward as the import volume increases.

The flexible tariff idea is supported by the mining industries and members of Congress from the mining states. Given the support of the oil and coal industries, a sizable bloc might be developed to work for the plan when the question of foreign trade comes up in Congress this spring.

The issue is wide open because many officials who would support the administration's opposition to quotas would be less resistant to a flexible tariff. This would be due primarily to the belief that such a plan would arouse less resentment abroad than a system under which duties jump from a low to a high figure with no intermediate steps.

Move on Mergers

The Federal Trade Commission is assuming a tougher attitude toward corporate mergers which may tend to reduce competition or lead to monopoly.

The fact that such a merger may change the pattern of competition in a single area of the country may be considered "prima facie" evidence of its illegality which a respondent will have to disprove.

Although the commission's policy was expressed in a case involving another industry, it was indicated the test of the "competitive pattern" would be applied to oil as well as other businesses.

In the case before it the commission conceded there was nothing to indicate that the mergers would change the situation from a competitive to a noncompetitive pattern but held that they "lead in the direction of what is sometimes called oligopolistic or 'monopolistic' competition, that is, to a situation where the remaining competition in the particular market is between big companies."

ROCKY MOUNTAIN

Bonanza Wells Up for Sale

WORLAND, Wyo.—Continental Oil Co. is negotiating the purchase of 34 producing oil wells in Bonanza field near here, according to officials of General American Oil Co. of Texas, operator and principal owner of the wells.

Purchase price reportedly will be about $30,000,000, with the sale being closed any day.

The wells were purchased in 1952 for about $20,500,000 and currently are producing about 3,500 bbl. of crude daily.

General American operates production in California, Texas, Illinois, Louisiana, and Wyoming. The company controls crude-oil reserves amounting to more than 50,000,000 bbl.

Olds Oil Merger Disclosed

CASPER, Wyo.—Olds Oil Corp., contract drilling company, is being merged with Great Lakes Oil & Chemical Co. as a result of the latter's purchase of the outstanding minority interest in the drilling firm.

Olds has been operated as a partially owned subsidiary of Great Lakes since 1951 when the oil company acquired control. Olds Oil recently acquired a lease on the 7,743-acre Sherwin Ranch tract at the southern end of the Weston County, Wyoming oil field. Five tests on this acreage are now drilling or planned.

In addition to Olds Oil drilling operations, it owns varying interests in 21 producing wells in the Weston County field. These will supplement the parent company's 49 producers in California and two gas wells in New Mexico's San Juan basin.

Gasoline Plant Planned

CASPER, Wyo. — Socony - Vacuum Oil Co., Inc., will be joined by seven other oil companies in the construction of a $1,500,000 gasoline plant at Manderson, Wyo., to process 15,000,000 cu. ft. of sour gas daily.

Hydrogen sulfide gas from the plant will be taken by Jefferson Lake Sulphur Co., which plans a sulfur-extraction plant in conjunction with the Socony-Vacuum installation.

Frank M. Parsons Co., Los Angeles, will be in charge of engineering and construction of both plants. Work will start immediately on engineering plans and construction is scheduled for early spring.

Other companies joining Socony in the plant will be Gulf Oil Corp., Sohio Petroleum Co., Shannon Oil Co., Stanolind Oil & Gas Co., Mule Creek Oil Co., G. & N. Oil Co., and Roy E. Rooth.

Dry gas from the plant will be taken by Montana Dakota Utilities Co. for distribution through its system.

Development Deal Signed

NEWCASTLE, Wyo.—Voss Oil Co. has signed a contract with Buckhorn Production Co., owned by the C. W. Murchison interests of Dallas, for the development of 17,000 acres in Weston County, Wyoming.

The contract calls for the drilling of a minimum of 42 wells with a total of 100 wells actually anticipated. Russell W. Bartels, secretary-treasurer and general counsel for Voss, said Buckhorn will start four rigs on the property immediately and will add two or more later.

Under terms of the contract, drilling costs will be paid from production with the Murchison interests acquiring a 5 per cent interest in the Voss properties after all production costs have been paid.

Merger Balloting Set

COLORADO SPRINGS. — Stockholders of Holly Oil Co. will vote January 23 on a proposal to merge Table Mesa Oil Co. with Holly.

Boards of both companies have approved the plan for issuing one share of Holly to holders of each six shares of Table Mesa. Both firms are oil-producing companies. Holly produced about 53,000 bbl. of crude during the fiscal year ending last June, and Table Mesa's production up to December 31 was about 40,000 bbl. for the year.

MID-CONTINENT

Gas Measure Appealed

TOPEKA. — The Kansas Supreme Court was asked last week to prevent the Kansas Corporation Commission from enforcing a new standard of measurement of gas produced in the state.

Appeals from a Shawnee County district court were filed by two major natural-gas companies after three firms failed to halt the commission revision in the lower court.

Last July, the commission defined a Kansas cubic foot of gas as that volume required to fill 1 cu. ft. of space at 60° F. under absolute pressure of 14.65 lb. Previously, 16.4 lb. pressure was the standard.

The appeal was filed by Cities Service Gas Co. and Kansas-Nebraska Natural Gas Co. after two district judges tossed their suit out of court at the request of the Kansas Commission. Northern Natural Gas Co. was a party in the original district court suit.

Journal Index Ready

Your copy of the 1953 Oil and Gas Journal Index is now ready. As in previous years, the index lists all engineering articles and principal news stories of the entire year by subject, geographical area, and author.

To obtain this handy and ready reference to material printed during 1953, merely drop a letter or post card to: Editor, The Oil and Gas Journal, Box 1260, Tulsa.

CANADA

Oil Canada's Top Mineral

OTTAWA.—Petroleum replaced gold as Canada's leading mineral in 1953, according to preliminary mineral production figures released by the Bureau of Statistics here.

The bureau reports that during the year, Canada's mineral production scored a record annual value of $1,331,000,000. Of this amount, crude-oil production claimed $198 million, a $55 million gain over the previous year. Also, crude output totaled 81 million barrels as compared with 61 million barrels in 1952.

Gold, which has been the country's top mineral for nearly 25 years, dropped in production by 410,000 oz. during 1953 due to prolonged strikes at some of the mines. Also, the bureau estimates that the mineral's value dropped from $153 million to $140 million in the 12-month period.

Royalite Buys Topping Plant

CALGARY, Ont. — Royalite Products, Ltd., a wholly owned subsidiary of Royalite Oil Co., Ltd., has purchased from Refinery Operators, Ltd., a 5,000 bbl. daily topping plant at Coleville, Sask., to be operated jointly with the Kamloops Royalite refinery now under construction.

The Coleville plant will continue to process fuel oils and asphalts from crude produced in Coleville field by Royalite and Canada Southern Oils, Ltd.

LATIN AMERICA

Pemex System Expands

Two additional branch products lines added to central Mexico system linking Salamanca refinery with markets

PETROLEOS MEXICANOS' pipeline system for distributing products from the Salamanca refinery in central Mexico has been rounded out with the completion of two additional branches.

An announcement of the government oil agency in Mexico City reported the completion of the 66½-mile, 4½-in. line from the refinery south to Morelia in the State of Michoacan. The same announcement said the 51.6-mile, 8-in. line from Lagos de Moreno in Jalisco to Aguascalientes in the state of the same name is now in operation.

The system from the refinery includes the line south to Morelia and another leading northwest to Lagos. From Lagos separate lines branch off to Guadalajara in Jalisco and to Aguascalientes. The 79.6-mile, 8-in. line from Salamanca to Lagos and the 116.8-mile, 8-in. line from Lagos to Guadalajara were completed earlier.

System capacity . . . The southern line to Morelia provides a capacity to deliver about 5,000 bbl. daily of white products to Morelia, Zacapu, Zamora, Uruapan, Apatzingan, and neighboring agricultural areas. It was built by Ballesteros Engineering Co. of Monterrey for Pemex.

The extension of the system from Lagos northwest to Aguascalientes has a capacity to deliver 15,000 bbl. daily. Pemex has plans for carrying this line on another 79 miles to Zacatecas in the state of the same name.

The refinery supplying the entire system from Salamanca is now being expanded from 30,000 to 40,000 bbl. daily through modifications in the primary distillation unit and planned changes in the pipe line which supplies it with crude from Poza Rica.

Other reports from Mexico City are that Pemex is giving new consideration to the construction of a complete new refinery at Tampico. This project has been in the planning stage for some time, but it is now reported that Pemex is making inquiries among engineering firms in the United States. The government company is studying modern processing equipment, possibly including a new-type continuous coking unit, to handle its heavy, asphalt crude. The three existing refineries near Tampico all were built in preexpropriation days, and are equipped with obsolete facilities.

Refinery Approved

Colombia accepts Intercol plans for coastal refinery

THE Colombian Government has conditionally accepted the proposal of International Petroleum Co. (Colombia), Ltd., to build a new refinery on the Caribbean Coast.

The government gave its approval of Intercol's plan to build the refinery without official participation provided it is started as soon as possible and finished by 1957, its production goes to meeting domestic needs before export, that sales at the refinery be without differentials or preferences, that domestic crude be used as far as possible, and that the War Ministry give final approval to the coastal site.

The project calls for a plant of 25,000 bbl. daily to meet requirements in both the Atlantic and Pacific Coast sections of Colombia. These areas are now supplied by imports, mainly from Aruba, since Colombia's refineries are all located in the interior along the Magdalena River without ready access to coastal markets.

Cost set at $35 million . . . The new Caribbean refinery is estimated to cost some $35,000,000. The most likely location is considered to be near Cartagena, which is the terminal of the 10-in. Andian National pipe line carrying crude from the De Mares and Casabe fields.

A government-appointed commission which studied Colombia's present and future petroleum needs recommended in its report last May that the Caribbean refinery be built, preferably with private capital but if necessary, with state financing. After this report, oil operators in Colombia were sounded out on the possibility of the refinery construction, and for a time the project was considered by the official government company, Empresa Colombiana de Petroleos, which has operated the De Mares concession since it reverted to the state in 1951.

At present the land-locked central and southern parts of Colombia are supplied by several small topping plants and the Barrancabermeja refinery which in 1954 will complete a program of expansion to 30,000 bbl. daily. Barrancabermeja is operated by Intercol under lease from the Empresa. Intercol is a subsidiary of International Petroleum Co., Ltd., as is also Esso Colombiana, S.A., the principal marketing company in Colombia.

Cuban Well Started

Central valley test is first deep one for independents

THE first deep well ever drilled in Cuba by independent interests was spudded in December 27 about 5 miles east of the Jatibonico River, which divides Santa Clara and Camaguey provinces.

The location is in the central valley far from the northern coastal area favored by the major companies and lies well north of the southern coast, which has received publicity but no drilling during the past 5 years.

Cia. Refineria Cabaiguan, S.A., using a government-purchased National 75 rig, idle since its acquisition 2 years ago, has contracted Kerr-McGee Oil Industries, Inc., drillers and toolpushers. All other employes are Cubans.

Plans are to carry the well beyond 10,000 ft. which will make it one of the few deep wells ever drilled in Cuba. The last effort was by Cuban Gulf Oil Co., off the north coast in 1951.

Santa Clara province appears to be the focal point of increased Cuban oil interest in 1954. According to the Cuban Department of Agriculture, Gulf plans to start exploratory drilling soon at Placetas, about 30 miles northwest of the new Jatibonico well. It has been persistently reported that Gulf has abandoned its holdings off the north shore and plans to investigate Cuba's central valley.

At the same time, the shallow Jarahueca oil field, midway between Placetas and the Jatibonico well, has brought in a new well. Despite limited and sporadic drilling, Jarahueca has continued to respond to drilling at new levels. A new well last month went to 3,060 ft. and has been producing 60 bbl. daily.

Creole Production Gains

Operated production of Creole Petroleum Corp. in Venezuela gained 32,217 bbl. daily in October to reach an average of 725,309 bbl. daily.

The monthly report of Creole, largest producing company in Venezuela, showed 592,535 bbl. daily of the October total coming from Lake Maracaibo fields, 7,039 bbl. daily from other western fields, and 125,737 bbl. daily from Eastern Venezuela. Net production plus purchased royalty oil amounted to 781,173 bbl. daily during the month.

Creole's refinery runs in October averaged 145,433 bbl. daily, including 66,350 bbl. daily from Caripito and 79,083 bbl. daily from Amuay. The company operated an average of 20.5 rigs and completed 8 exploration wells, 3 of them oil producers, as follows: East Pilon, 144 bbl. daily initial production; Cumarebo, 453 bbl. daily initial production, and Uracoa, 169 bbl. daily initial production.

Argentine Lines Planned

Three major pipe-line projects totalling 2,450 miles are under consideration by Yacimentos Petroliferos Fiscales, government oil agency of Argentina.

The three projects, according to Carlos Blanco, engineer in charge of oil and gas pipe lines, are a 400-mile, 12-in. crude line from Plaza Huincul to Bahia Blanca; a 1,100-mile natural gas line from Campo Duran to Buenos Aires, and a 950-mile, 12-in. products line from Campo Duran to San Lorenzo.

Specifications are now being prepared for the Plaza Huincul crude line and construction is scheduled for the near future.

The new Campo Duran producing area near the Bolivian border has two fields producing condensate. Two fields, Duran and Madrejones, are located only 6 kilometers apart and are regarded as producing from the same reservoir.

AIRPORT PHOTO shows P. C. Lauinger, left, and Mitchell Tucker as they left for Caracas.

Two Journal Officials Visiting Venezuela

P. C. Lauinger, publisher of The Oil and Gas Journal and Petroleo Interamericano, and Mitchell Tucker, vice president and advertising manager of the magazines, arrived in Venezuela January 3 for a series of conferences with government officials and oil-company executives and personnel.

Lauinger and Tucker paid an official courtesy call January 4 on Dr. Edmundo Luongo Cabello, minister of mines and petroleum. During the remainder of their stay in Caracas, they discussed circulation, editorial, and other publication matters with Creole Petroleum Corp., Cia. Shell de Venezuela, Mene Grande Oil Co., Socony-Vacuum Oil Co., Texas Petroleum Co., Venezuelan Atlantic Refining Co., Richmond Exploration Co., Sinclair Oil & Refining Co., Pantepec Oil Co., Phillips Petroleum Co., Loffland Bros. Drilling Co. of Venezuela, and others.

This week Lauinger and Tucker are visiting oil-company operations in the Lake Maracaibo district, where the majority of drilling and producing operations are conducted over water in Lake Maracaibo. Water depth at some locations approaches 100 ft. Tucker later plans to visit oil operations in Eastern Venezuela, including the large Jusepin and Greater Oficina areas.

Petroleo Interamericano, Latin American sister publication of the Journal, is celebrating its tenth anniversary this year. The magazine is a monthly technical-operating publication printed in both Spanish and English and designed for oil companies operating throughout the Latin American countries.

EUROPE

Refinery On Stream

Condor puts 45,000-bbl. Milan plant in operation

THE new Condor refinery, a 45,000-bbl. daily plant at Rho near Milan in northern Italy, has completed its trial runs and has been placed in full operation.

The refinery was built at an over-all cost of $35,000,000 and includes the largest catalytic cracker in Italy, a 15,000-bbl. daily T.C.C. unit. Other facilities include 65 storage tanks of total capacity of 2,350,000 bbl., treating plants, a steam generation plant with a capacity of 300,000 lb./hour, a power generation plant rated at 8,400 kw., machine shops, warehouse, administration building, and rail and truck loading equipment *(The refinery was described in detail in The Oil and Gas Journal, December 29, 1952, page 88).*

E. B. Badger & Sons, Ltd., London, a subsidiary of Stone & Webster Engineering Corp., served as mechanical designers, procurement agency, and construction management organization. Design and engineering was started in 1951 with construction in the field under way at the end of that year and the final stages completed by last August. Extensive test runs followed.

The Po River Valley site for the refinery covers a square mile. Expansion in the foreseeable future is expected to include extensive facilities for the production of petrochemicals. Middle East crude is used as charge stock for the refinery. It is delivered by tanker to Genoa and then moved through a 12-in. pipe line to Rho.

The operating company, Condor S. p.A. per l'Industria Petrolifera e Chimica, is an Italian firm. The process plants were designed in the United States by Stone & Webster, and construction carried out by American and Italian engineers with an area recruited labor force. The operating force currently numbers about 700 persons.

British Drop Brokers Award

The use of the Brokers Award to determine time-charter tanker rates has been discontinued by the two leading British oil companies, Anglo-Iranian Oil Co., Ltd., and the Shell organization.

In London, Anglo-Iranian said that the index was adopted under circumstances of tanker tonnage shortage causing high rates for prompt fixtures and generally unstable market conditions. At present, in view of the ample supply of vessels of charter requirements, freight charges can satisfactorily be determined "in normal business procedures."

The Brokers Award is a semiannual assessment of tanker rate market conditions. Each April and October the award has been announced as the current rate for a 2-year time charter for a standard motor tanker of 12,000 d.w. tons. The award was used in calculating the freight component and thus was an important factor in the final selling price in foreign markets.

The award rate rose steadily through 1950 and 1951 to a high of 52s (about $7.30) per ton per month in April 1952. Sharp drops were shown in succeeding awards, and the latest, last October, called for 18s 6d (about $2.59) per ton per month.

European Manufacturers Unite

Equipment manufacturers in six European countries have formed a European Federation of Petroleum Equipment Manufacturers.

Principal aims of the organization are: Coordination of technical information to improve quality of design and construction and encourage further standardization; encourage the flow between countries of information on research and its applications; serve as spokesmen for manufacturers in obtaining top-level assistance in solving international economic problems affecting the equipment industry; and make the world market fully aware of the "great possibilities and capacity of European producers" of oil equipment.

Douglas Wilson, chairman of the Council of British Manufacturers of Petroleum Equipment was named president of the new organization. Maurice Poignon, delegate of the French Association of Equipment Suppliers to the Petroleum Industry, was appointed secretary. Headquarters will be at 10 Avenue Hoche, Paris 8. The organization was formed at a meeting of manufacturers in Paris.

MIDDLE EAST

Israeli Outlook Bright

Returning from two months in the Middle East, Max Ball, Washington consultant, reported last week that exploration is proceeding "most satisfactorily" in Israel under the 1952 petroleum law which he helped draft.

Ball said geological and geophysical work thus far has either confirmed the favorable character of the structures previously known or had indicated the presence of structures not previously known. Activity extends from Haifa Bay and Mount Carmel on the north, south through the coastal plain to beyond Gaza, across the northern Negev to the Wadi Araba, and north along the Dead Sea to Ein Gedi at the Jordan border.

In the 6 months following passage of the law that opened the country to foreign oil companies, Ball said, four groups operating on behalf of seven companies or individuals holding interests in 32 licenses have spent around $600,000, not counting investment in drilling equipment. One well is already drilling with cable tools, two heavy-duty rotary rigs have arrived in the country, and two more, plus a core drill outfit, are on order. Ball said the fact that the companies have bought or ordered more than $4,000,000 worth of drilling equipment shows the encouragement given the programs thus far.

Fruit for Oil

Russians trade fuel oil for Israeli citrus fruit

RUSSIA has begun shipping fuel oil into Israel under a recently negotiated barter agreement.

The first shipment reached Tel Aviv on the Italian tanker Sicanos and was loaded at the Black Sea port of Novorossisk. It consisted of 10,000 tons, or about 65,000 bbl., of heavy fuel oil.

The Israel National Fuel Corp. (Delek) is paying for the oil by sending citrus fruit to Russia. The contract calls for delivery of 100,000 tons, or about 650,000 bbl., of Russian fuel oil, with an option on another 100,000 tons.

Russia, which has reentered the world oil trade over the last year with offers to barter deals to a number of Western countries, approached Israeli officials late last summer. Subsequently samples of Russian crude were sent to Israel but they were found to contain too high a percentage of salt for processing at the Haifa refinery. The deal was then worked out in terms of heavy fuel oil.

The 86,000-bbl. daily Haifa refinery, owned by Anglo-Iranian and Shell, has been operating at reduced throughput using Venezuelan crude for the last several years because of the stoppage of pipe-line shipments to the refinery from Iraq.

Israel has been covering its sterling oil requirements by shipping citrus fruit and other goods to Britain, but payment for sterling oil is now made from the reparations Israel is receiving from West Germany. About half of the approximately £18,000,000 ($50,400,000) reparations thus far have been spent on British oil.

ASIA

Patiya Well Plugged

Second East Pakistan well abandoned at 10,000 ft.

THE East Pakistan exploratory program received a second setback with the abandonment of the Patiya wildcat in the Chittagong Hill Tracts.

The hole was taken to 10,175 ft. by Pakistan Petroleum, Ltd., with no signs of oil or gas. Core evidence showed the dip of the beds to be 70° or more at depths below 9,500 ft. Last spring the company abandoned a fourth test of the Patharia area in East Pakistan and gave up attempts to find oil in this structure.

Pakistan Petroleum, a subsidiary of Burmah Oil Co., Ltd., is continuing its plans to survey other likely areas of East Pakistan. Gravimeter work was carried out in a large area of East Bengal, and the company is now running seismograph over part of this area near Sylhet.

West Pakistan gas . . . Meanwhile, in West Pakistan, it has been reported that the World Bank has agreed to finance a project for the utilization of natural gas from Sui where Pakistan Petroleum made the discovery in November 1952. The Sui area was said to be capable of producing 100,000,000 cu. ft. daily for a 60-year period, and a 16-in. pipe line has been proposed from the producing area to Karachi via Sukkur, Rohi, Hyderabad, and Kotri.

The gas, to be used for industrial purposes, would cut Pakistan's coal imports by an estimated 1,600,000 tons annually and provide a corresponding savings of foreign exchange. The two wells drilled by Pakistan Petroleum at Sui showed the presence of appreciable gas reserves. The pipe-line project is to be undertaken by the Pakistan Industrial Development Commission, with half the cost of about $28,000,000 to be met by the World Bank.

AUSTRALIA

Shell to Build Cat Cracker

The Shell Co. of Australia, Ltd., has announced plans for the addition of a catalytic cracking unit at its new refinery now nearing completion at Geelong, near Melbourne.

The catalytic cracking unit will have a capacity of 650,000 tons (about 12,000 bbl. daily) and is scheduled for completion in mid-1955. The Geelong refinery, which has a 25,000 bbl. daily crude charge capacity, is scheduled to be opened formally in ceremonies March 18. The present project includes distillation facilities, tanker jetty, and a 36-mile, 8-in. products line into Melbourne.

With the Shell announcement, catalytic cracking equipment will be provided at all four major new refineries under construction in Australia. These units are being included at the Anglo-Iranian Oil Co., Ltd., refinery in Kwinana in western Australia, the Vacuum Oil Co., Ltd., refinery near Melbourne, and the Australian Oil Refining, Ltd. (Caltex) plant near Sydney.

Petrochem Firm Formed

A new company, Petroleum & Chemical Corp., has been registered in Australia to engage in petrochemical activities.

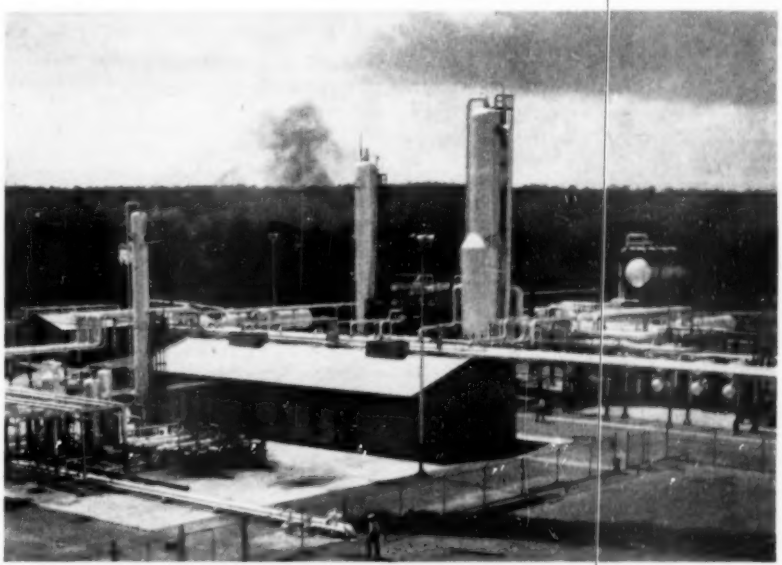
The undertaking is being financed essentially from Australian capital. Bitumen & Oil Refineries (Australia), Ltd., make a direct investment of about $450,000 and its stockholders will be given the opportunity to take 300,000 shares of A£1 ($2.25) each. The remaining $1,860,000 of capital will come from a public stock issue. Bitumen & Oil Refineries, in which Caltex has a minority interest, operates a refinery of about 7,000 bbl. daily capacity near Sydney.

International Briefs

Polyethylene to be produced in West Germany by the new joint petrochemical undertaking of Badische Anilin und Soda Fabrik, A.G., and Deutsche Shell, A. G., will be sold under the trade name, Lupolen, which belongs to Badische Anilin und Soda Fabrik. Polythene and ethyl benzene will be manufactured in a large plant which a joint operating subsidiary is preparing to build at Wesseling near Cologne *(The Oil and Gas Journal, November 9, page 81)*.

American International Fuel & Petroleum Co. has resumed drilling in its Ragusa, Sicily, discovery well after a brief shutdown. The hole is being carried deeper in order to assess thoroughly the prospects of the structure. The company, a wholly owned Gulf subsidiary, tested heavy oil earlier at about 6,200 ft. The gravity of the crude ranged around 20° A.P.I., or about the same as Lagunillas in Venezuela, according to reports on the operation.

D'Arcy Exploration Co., Ltd., is completing its Plungar well near Nottingham in northern England at around 2,820 ft. in formations from which some oil was obtained in earlier testing



Jusepin Field Has Modern Field-Processing Units

This modern field-processing installation is the stabilization plant of Creole Petroleum Corp. at Jusepin in the State of Monagas in eastern Venezuela. During the first 8 months of this year, crude production from Jusepin field averaged 18,661 bbl. daily. (A Creole photo.)

PERSONALS

Pipe Line President

Canadian takes executive post with Trans Mountain

A CANADIAN who has literally grown up with Canada's oil industry has taken over the helm of Trans Mountain Pipe Line Co.

J. Grant Spratt, former president of the Anglo-Canadian Oil Co., Ltd., became president of Trans Mountain the first of the year. He succeeds R. L. Bridges, San Francisco, who will continue to act as a director of the company.

Spratt's elevation to chief executive of the line was in accordance with the policy adopted by the board of directors of the company at the time it was formed. The board determined that the line's permanent staff would consist of Canadian and British Commonwealth personnel.

Spratt, a native of Hawesbury, Ont., has spent his entire business career in Canada's oil industry. He attended the University of Manitoba, where he obtained his B.A. and M.A. degrees in geology, and in 1926 was appointed geological engineer for the Department of Interior at Calgary. In 1931 he was transferred to the Alberta Department of Lands and Mines as geological engineer and then served as district petroleum engineer for the department at Calgary from 1932 to 1938.

Business background . . . He joined Anglo-Canadian in 1938 as assistant manager and became general manager 2 years later. He was appointed vice president and general manager in 1943 and was named managing director in 1946. He became president of the company last year.

In addition to his activities with Anglo-Canadian, Spratt has been a member of the board of nine other Canadian oil companies. He is a member of the Professional Engineers of Alberta, a charter member of the Society of Petroleum Geologists and a member of the American Association of Petroleum Geologists.

Spratt will move his home to Vancouver, where the pipe-line company has just completed a new head office building to house executive offices and general administrative departments. The building will also house the dispatching staff and communications center which provides continuous contact with all sections of the pipe line from Edmonton to Vancouver.

W. A. Greeven, presently representative in Lisbon, Portugal, of Standard Oil Co. (N. J.) for Portugal, Spain, and northwestern Africa countries, will join Creole Petroleum Corp. in Caracas, Venezuela, April 1. He has spent more than 25 years with many of Jersey's affiliates in Latin America and Europe.

John Wach, former operations superintendent of the British American Oil Co., Ltd., refinery at Montreal, has been appointed superintendent of Kamloops, B. C., refinery of Royalite Oil Co., Ltd., now under construction.

Glen W. Barb has been promoted by Magnolia Petroleum Co. from petroleum engineer at Duncan, Okla., to district petroleum engineer at Wewoka, Okla.

Wallace W. Mitchell of Coalinga, Calif., has been appointed acting superintendent of Tide Water Associated Oil Co.'s San Joaquin Valley pipe-line system, replacing **Grove E. Herrmann,** who has retired. Mitchell will make his headquarters in Coalinga, head office of the 250-mile crude-oil carrying system, and will supervise the company's Valley gathering and trunk line system and its Monterey, Calif., marine terminal.

Robert R. Munoz, Southwood Exploration Co., Inc., has been elected president of the Rocky Mountain Association of Geologists. Other officers are: **Raymond M. Thompson,** Hiawatha Oil & Gas Co., first vice president; **Robert L. Anderson,** Geophoto Services, second vice president; and **John E. Blixt,** The Texas Co., secretary-treasurer.

Ralph E. McMillen, formerly head geophysicist for Phillips Petroleum Co. in Caracas, Venezuela, has joined Midstates Oil Corp. as head geophysicist in Tulsa.

Robert Doyle has joined Tide Water Associated Oil Co.'s West Texas-New Mexico district office in Midland, Tex., as a stratigrapher. He had been district manager for 2½ years for Claud B. Hamill, independent operator. Prior to this he was with Shell Oil Co. for 12½ years.

Howard (Tom) Odiorne, formerly with Atlantic Refining Co. at Shawnee, Okla., has been named Rocky Mountain district geologist in Denver for C. G. Glasscock Oil Co., Corpus Christi, Tex.

Joe E. McGeath has been appointed general superintendent of Magnolia Pipe Line Co., replacing **A. T. Glover,**

J. E. McGEATH

J. G. NORTON

who has retired after 41 years with the company. Glover had been general superintendent since 1942 and a director since 1952. He has been replaced on the board by **John G. Norton,** chief engineer. **R. L. Taylor** has been named assistant to the manager, and **J. J. Harris** has been transferred from the company's engineering department to the dispatching department as engineer. McGeath joined Magnolia Pipe Line in 1923 and was appointed assistant general superintendent in 1946. Norton has been with the firm since 1927 and was made chief mechanical engineer in 1938. He was loaned to War Emergency Pipe Lines during World War II.

Sam H. Casey, formerly general manager of purchases, has been promoted by Pan-Am Southern Corp. to general manager of supply and transportation. **L. F. Andry,** formerly assistant traffic manager, has been advanced to traffic manager. The promotions are in conjunction with a merging of the activities of the general manager of purchases into the supply and transportation department of the company.

PERSONALS

G. W. Walker, formerly petroleum engineer for Magnolia Petroleum Co. at Lake Charles, La., has been made assistant production foreman at Falfurrias, Tex.

Capt. Louis C. McKay has been named marine superintendent by Pan American Petroleum & Transport Co. and its affiliate, American Oil Co. He succeeds **Verne N. Drew,** who recently was named marine operating manager.

Robert L. Poundstone has been appointed superintendent of production by **Gene Goff** of Goff-Leeper Drilling Co., Tulsa. He has been with Carter Oil Co., Christensen Diamond Products Co., and most recently was engineer and assistant to the production superintendent for Toklan Production Co.

R. M. CHESNEY

Robert M. Chesney, manager of Deep Rock Oil Corp.'s refinery at Cushing, Okla., has been promoted to vice president in charge of manufacturing. In addition to overseeing refinery operations, he will assume new administrative responsibilities and will be in charge of the firm's pipe-line operations. His headquarters will remain in Cushing, but operating headquarters of the pipe-line department will continue to be located in Tulsa, with **J. H. Tubbs** as manager. Chesney joined Deep Rock in 1951 as manager of the Cushing refinery.

C. G. Dahm, Hunt Oil Co., has been elected president of the Dallas Geophysical Society for 1954. He previously served as first vice president. Other officers named include: **J. D. Perryman,** Geotechnical Corp., first vice president; **J. A. Lester,** Magnolia Petroleum Co., second vice president; and **E. J. Stulken,** Geophysical Services, Inc., secretary-treasurer.

Ralph K. Hoitsma has been transferred by Standard Oil Co. (Ohio) from manager of research and development to manager of the wage and salary administration. **Karl H. Kuhlman,** formerly assistant to the manager of labor relations, has replaced him as manager of research and development. Kuhlman, however, will continue as secretary of the industrial-relations staff and committee. The changes are part of Sohio's management-development program.

Geophysical Society Picks New Leaders for 1954

New officers elected recently by the Permian Basin Geophysical Society are (left to right): Lindley Latham, E. I. du Pont de Nemours & Co., Inc., treasurer; Charles (Chuck) Kerr, Continental Oil Co., second vice president; C. Newton Page, Continental Geophysical Co., president; W. A. Reeves, Midland Geophysical Co., first vice president; and Victor Bychok, Atlantic Refining Co., secretary. They are all from Midland, Tex.

Henry Power, staff engineer in General Petroleum Corp.'s production department since 1942, has retired. He joined the firm in 1919.

R. F. Cast, geologist for Northern Natural Gas Producing Co., has been transferred from Amarillo, Tex., to the firm's new office in Midland, Tex. **E. C. Philpy,** formerly with Shell Oil Co., also has joined the Midland staff.

Rex C. Hensel has been named area purchasing and stores manager in Los Angeles for Shell Oil Co., replacing **A. E. (Al) Collins,** who has retired after holding the post since 1944. Collins had been with Shell almost 42 years, making him the oldest Shell employe in years of service in the western half of the United States.

L. C. Duncan has been named general manager of the newly organized organic-chemicals division of American Cyanamid Co. The new division merges activities of the company's petrochemicals division and the Calco chemical division. **V. E. Atkins** has been appointed assistant general manager.

Harry M. Edelstein, assistant solicitor of the Interior Department, has resigned to return to private practice of law in Washington after 18 years of government service. Edelstein is a specialist in oil and gas matters relating to the federal lands and the Continental Shelf and, as head of the public lands division of the solicitor's office, was responsible for the handling of all appeals to the secretary in cases relating to the Bureau of Land Management, Geological Survey, Bureau of Mines, and the Connally Hot Oil Act.

M. T. Fairchild, district superintendent for Cities Service Pipe Line Co., has been transferred from Oklahoma City to Lake Charles, La.

Flavy Davis, manager of exploration of American Republics Corp. for the past 3 years, has been named acting manager of Tennessee Production Co.'s northern division, with headquarters in Wichita Falls, Tex. He replaced **James Nash,** who has resigned to become a consultant.

A. J. (Al) Walker, Evansville, has been elected president of the Indiana Oil and Gas Association. Other officers are: **John Hall,** Sohio Petroleum Co., and **V. R. (Vic) Gallagher,** Pursuit Oil Co., vice presidents; and **E. J. (Ed) Reading,** Sun Oil Co., secretary-treasurer.

Henry Rogatz has been elected president for 1954 of the Dallas Geological Society, replacing **W. Dow Hamm.** He served as vice president during 1953. **G. F. Shepherd** was named vice president, moving up from secretary-treasurer, and **H. B. Renfro** was elected secretary-treasurer. **John Clayton,** Seaboard Oil Corp. of Delaware, also was elected to the society's executive committee.

W. J. Sheridan has become process superintendent at Esso Standard Oil Co.'s refinery at Bayway, N. J., replacing **John P. Allen,** who is now assistant mechanical superintendent in the mechanical department. The changes are part of the company's various rotational assignments. Other shifts under the plan include: **Ralph B. Weidman,** moved from assistant mechanical superintendent to new-projects coordinator;

PERSONALS

and **G. E. Filler,** technical assistant to the process superintendent, to special assignment to handle the process phases of the fuel-products improvement program.

William R. Black has been advanced by Ohio Oil Co. from assistant to field foreman in the Glenn's Camp area southwest of Robinson, Ill.

M. T. Carpenter, administrative director for Standard Oil Co. (Ind.), has been elected president of the Scientific Manpower Commission for 1954, succeeding **Howard A. Meyerhoff,** the commission's first president. Dr. Meyerhoff will continue to direct organization's activities under the title of executive director.

M. D. Mauck, Pure Oil Co., has been elected president for 1954 of the Fort Worth Geological Society. Other officers include: **T. A. Hendricks,** Stanolind Oil & Gas Co., first vice president; **R. H. Rantala,** Brown & Wheeler, second vice president; **W. L. Gupton,** Texas Pacific Coal & Oil Co., secretary; and **K. W. Nickerson, Jr.,** McElroy Ranch Co., treasurer.

John E. Swearingen has been elected vice president in charge of production by Standard Oil Co. (Ind.). He will have charge of production, crude-oil supply, and products pipe lines, and also will coordinate activities of the parent company with such principal subsidiaries as Stanolind Oil & Gas Co., Service Pipe Line Co., Stanolind Oil Purchasing Co., and Utah Oil Refining Co. Swearingen, with Standard since 1939, has been general manager of production since 1951 and was made a director in 1952.

Dr. William J. Sparks, Standard Oil Development Co., has been selected to receive the 1954 Gold Medal of the American Institute of Chemists. Dr. Sparks is coinventor of butyl synthetic rubber and is director of the chemical division and coordinator of exploration research for Standard Development. He has been with the firm since 1936. The medal, the twenty-sixth to be awarded, will be presented in May at the institute's annual meeting at Asbury Park, N. J.

William L. Robbins, petroleum engineer for Carter Oil Co., has been transferred from Tulsa to St. Elmo, Ill.

W. F. West has resigned from Continental Oil Co. in Fort Worth to become manager of engineering and exploration activities for **J. B. Stoddard,** Dallas independent operator.

William Carr, Pure Oil Co., Bismarck, has been elected president of the North Dakota Geological Society. Other officers elected, all from Bismarck, are: **John Lapp,** Union Oil Co. of California, vice president; **Andre J. Masson,** Skelly Oil Co., secretary; and **Steve Harris,** Harris & Brown, treasurer.

Wallace E. Avery has been named assistant secretary of The Texas Co. He formerly was assistant general manager of the industrial and public relations department and was assistant chief counsel for the Petroleum Administration for War from 1942 until he joined the company in 1945.

J. W. Thomas has been appointed manager of Australian exploration by West Australian Petroleum Pty., Ltd., replacing **C. T. Newcomb,** retired. With California Texas Oil Co., Ltd., since mid-1948, when he was transferred from Standard Oil Co. of California, Thomas served in the New York office of Caltex as assistant manager of producing operations in Bahrain and Australia. In August 1953 he was assigned to Perth, Australia, as assistant manager of Australian exploration.

R. M. Foster, field representative in Cities Service Oil Co.'s division office in New Orleans, has been transferred to the company's general headquarters in Bartlesville, Okla., to take charge of Oklahoma crude-oil purchases and sales. **M. A. Wilson, Jr.,** has been transferred from Roswell, N. M., to New Orleans to replace Foster. Wilson had been field representative in charge of New Mexico crude purchases and sales.

G. A. Davidson has been elected to the board of directors of Standard Oil Co. of California to succeed **B. W. Letcher,** who has retired after 43 years with the company. Letcher has been a vice president since 1944 and a director since 1949. He also has been a director for several years of Arabian American Oil Co. and Trans-Arabian Pipe Line Co. Davidson joined the company in 1920 and was superintendent of the El Segundo, Calif., refinery from 1933 until becoming assistant to the general manager of manufacturing in San Francisco in 1938. He became assistant general manager in 1943, and was made a vice president in 1944.

Frank M. Dawson has been appointed manager of the purchasing department of The Texas Co. He was vice president and later executive vice president and director of Carthage-Hydrocol, Inc. Dawson first joined The Texas Co. in 1928 and held various positions in Texas, New York, and Illinois until he became associated with Carthage-Hydrocol in 1946.

V. E. Middlebrook, engineering consultant, Tulsa, has gone to Bogota, Colombia, to make an economic study of the five natural-gasoline plants operated by Empresa Colombiana de Petroleos in Colombia.

B. T. Jordan, Jr., has joined Dow Chemical Co.'s Texas division at Freeport, as a research and development engineer in the organic research department. Other additions include: **J. A. Wilkinson,** research and development engineer in the chemical-engineering department; **R. M. Waters,** chemist in the chemical engineering department; **P. M. Johnson, Jr.,** chemist in the organic laboratory; **R. E. Thompson,** production-development engineer; and **J. C. Smith,** chemist.

B. M. Downey, formerly manager of Shell Chemical Corp.'s Houston plant, has been appointed manager of manufacturing, a new position in the company's New York office. He will be replaced at Houston by **Glenn Purcell,** manager of Shell Chemical's now-building Norco, La., plant, who was transferred to Norco recently from a position as manager of the firm's Dominguez, Calif., plant. Purcell has been replaced as plant manager at Dominguez by **O. M. Williams,** formerly assistant to the vice president in the New York office. Purcell joined Shell in 1929 and became superintendent of the Houston chemical plant in 1951. He was made plant manager at Dominguez in 1952. Williams, prior to his New York assignment, was manager of Shell Chemical's Martinez plant.

PERSONALS

Charles R. Unsworth, Dallas independent operator, has been elected vice president of Caribbean Oil Corp.

Robert K. James, petroleum engineer for Magnolia Petroleum Co. in Houston, has been promoted to senior petroleum engineer.

Donald R. Zaremski has been transferred by Magnolia Petroleum Co. from West Texas to El Dorado, Kans., as junior petroleum engineer.

Ray Scurlock, geologist with Gulf Refining Co., has been transferred from Shreveport, La., to Tulsa.

George E. Taylor, geologist, has joined Southern Independent Oil & Refining Co. at Evansville, Ind. He had been with S. D. Jarvis, independent producer and refiner, and was with Continental Oil Co. for 12 years in Evansville.

S. D. McMurry, manager of Cities Service Oil Co.'s refinery at Ponca City, Okla., has been transferred to the firm's headquarters in Bartlesville, Okla., on special assignment. **D. R. McConnohie,** Bartlesville, assistant to the general superintendent of refining, has assumed McMurry's duties as manager of the Ponca City refinery.

Phillip J. Mullin has resigned as division manager of the Rocky Mountain Oil and Gas Association's Colorado-Nebraska division, following his appointment as special assistant to **Fred A. Seaton,** assistant Secretary of Defense for legislative and public affairs. He had held the post for 4 years in Denver.

George G. Iles has resigned as assistant chief geologist for Union Sulphur & Oil Corp. in Houston to become a consulting petroleum geologist in Lake Charles, La. Iles had been with Union since 1946 and was South Louisiana district geologist at Lake Charles before he was recently transferred to Houston.

Albert S. Munneke, superintendent of Service Pipe Line Co.'s Salt Creek district in Wyoming, has been transferred to Williston, N. D., as superintendent of a new district. **John H. Keyes, Jr.,** Casper, formerly division chief engineer in Wyoming, has replaced Munneke, and **W. L. (Stretch) Kennedy, Jr.,** has been transferred to Casper temporarily to replace Keyes.

Winston Glenn Smith, petroleum engineer formerly with Tennessee Production Co. at Victoria, Tex., has joined Austral Oil Exploration Co., Inc., in Houston.

W. E. Reed, drilling superintendent for Stovall Drilling Co., has been transferred from Texhoma, Okla., to Monroe, La.

E. J. Horan, geologist with Seaboard Oil Co. of Delaware, has been transferred from Cody, Wyo., to Powell, Wyo.

John W. Hopkins, superintendent of compressor stations since 1944, has been advanced by Colorado Interstate Gas Co. to general superintendent. He joined Colorado Interstate in 1929.

Wayne Loudermilk, formerly driller with Arrow Drilling Co. Canada, Ltd., at Olds, Alta., has been made toolpusher with Hunter Drilling, Ltd., in Kindersley, Sask.

H. E. Handy has been appointed to the newly established position of manager of Ohio Oil Co.'s refinery at Robinson, Ill. He had been refinery superintendent for the past 7 years and recently completed 30 years with the firm. **D. L. Winsett,** assistant refinery superintendent since 1939, has replaced Handy.

David P. Rothrock, senior geologist for Carter Oil Co., has been transferred from Vernal, Utah, to Durango, Colo.

B. E. Yester, production engineer for Ohio Oil Co., has been transferred from McFadden, Wyo., to Grass Creek, Wyo.

Don M. Wilson, president since 1943 of Preston Oil Co., the oil subsidiary of Colombia Gas System, Inc., has retired after 44 years with Columbia System companies. He has been, at one time or another, a director of every operating company in the system and has been an officer in each of the operating groups.

R. J. Irvin has been made general manager of Seaside Oil Co., refining and marketing subsidiary of Tide Water Associated Oil Co. His assignment follows the appointment of **Harry A. Jackson,** president of Seaside, as a vice president of Tide Water's eastern division. Irvin has been with Seaside as vice president and sales manager since 1947.

DEATHS

Thomas W. Pew, 49, president of General Crude Oil Co., died January 4 in Houston. He was a son of John G. Pew, retired president of Sun Shipbuilding Corp., Chester, Pa., and a nephew of the late Joseph N. Pew, former president of Sun Oil Co. Pew entered the oil industry as a scout in Texas and Louisiana for Sun and later was supervisor of production in California. He became vice president in charge of production when General Crude was established in 1933 and was advanced to president in 1944.

Charles G. Yankey, 74, died recently in Wichita, Kans. He was chairman of the board of El Dorado Refining Co. and president of K. T. Oil Corp., Wichita. He also had been associated with Derby Oil Co.

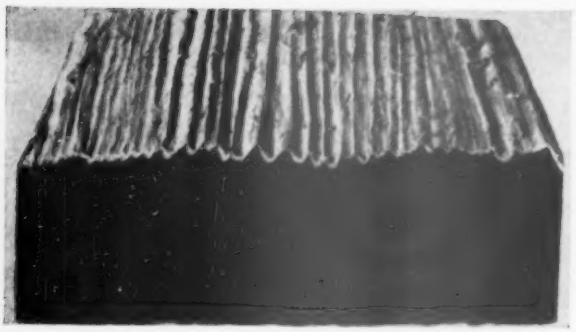
Robert E. Sullivan, 81, died recently in Wichita, Kans. He was one of the first American technicians to aid in developing oil fields in Romania. Later he went to Peru as manager of operations for Standard Oil Co. (N. J.). In 1919 he went to Kansas as a drilling contractor and also worked in Oklahoma and Texas fields. He retired 10 years ago.

John B. Beman, 65, president of Pennzoil Co. of California, died recently in Los Angeles following a heart attack. He became counsel for Pennzoil in 1915 and was elected president in 1941.

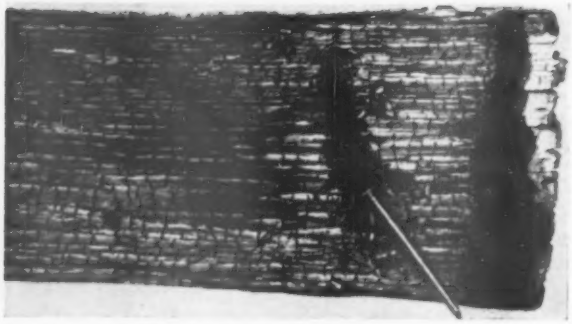
Walter B. Templeton, 81, died recently in Hinsdale, Ill. He was founder of Templeton, Kenly & Co., Broadview, Ill., manufacturers of mechanical and hydraulic jacks.

Lewis H. Hollingsworth, 53, production foreman for Ohio Oil Co., died recently in Los Angeles. He had been with Ohio for 23 years.

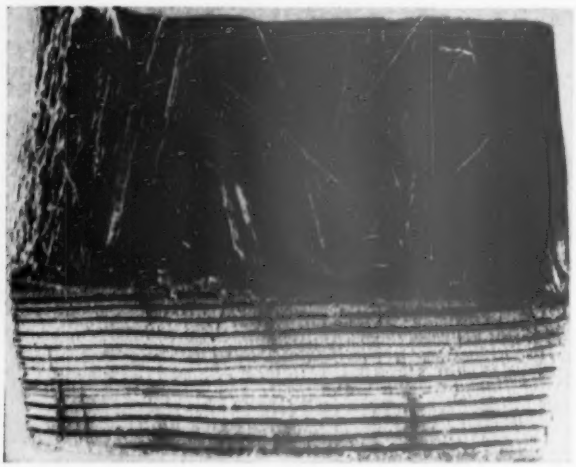
William McCormick, 64, chemist for Cities Service Oil Co. for 30 years, died January 3 in Elizabeth, N. J.



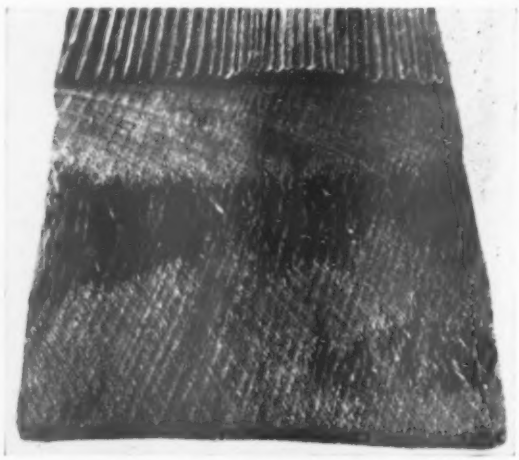
EARLY STAGES of chemical attack of the white fibrous surface type, in which sound internal wood structure remains intact. White surface condition is evidence that selective removal of lignin and extractives has occurred. Fig. 1a.



SURFACE BIOLOGICAL DETERIORATION after several years of operation in a circulating system in which pH of 8.0 to 8.8 had been maintained. Photo shows ease with which brash, crumbly surface may be scraped off. Fig. 2.



ACID-DEGRADED WOOD from air inlet louver position after 10 years of continuous service in an area exposed to air-borne acid fumes. Sample came from totally dry position not exposed to circulating water. Fig. 1b.



INTERNAL BIOLOGICAL DETERIORATION in early stages. Photo shows relatively sound exterior surface and soft degraded internal wood. Probing with an ice pick or sharp knife will usually expose such decay condition. Fig. 3.

What's new in

COOLING-TOWER-WOOD MAINTENANCE

A summary report of investigations by technical subcommittee No. 3, Cooling Tower Institute. Released exclusively to The Oil and Gas Journal for publication in the oil and gas field.

by C. L. Blohm, M. Tarplee, and E. C. Smith

RESULTS of studies made on 103 cooling towers operating in the Gulf Coast area indicate that:

- Proper water treatment can prevent excessive chemical deterioration and at the same time minimize the possibility of infection by wood-destroying organisms.

Authors are members of Technical Subcommittee No. 3, Cooling Tower Institute, 444 Emerson Street, Palo Alto, Calif.

- Prevalence of decay is not sufficient to warrant the recommendation that treated lumber be used in cooling towers.
- High operating temperatures serve to intensify the surface attacks.
- If pH and inlet-water temperatures are controlled within reasonable limits, total wood lost by all types of deterioration should be nominal.

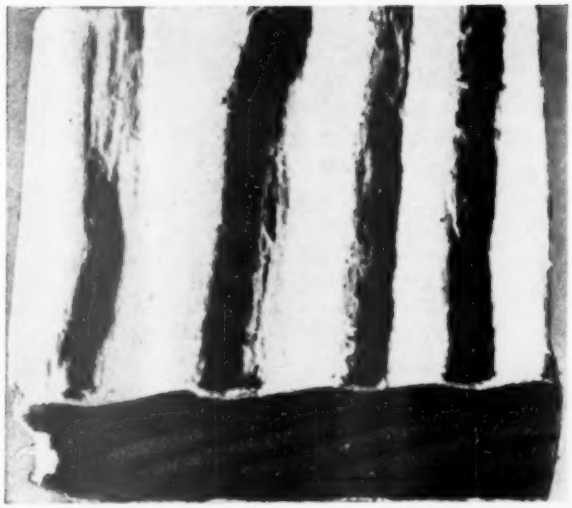
These studies are continuing.

Types of Deterioration

Although seven types of deteriorated wood have been analyzed, for the purpose of this study the deterioration has been segregated by arbitrary definition into two major categories.

Surface deterioration . . . The first of these occurs on the **surface** of the wood and may be clinically subdivided into two types:

1. Chemical action; probably entire-



FLOODED AREA (deck batt) sample of surface chemical attack in which delignified wood evidences a ridged surface, bleached and whitened after 12 years of continuous service. Adequate strength remains in the unaffected wood. This type attack is closely related to water composition. Fig. 4.

INTERNAL biological attack in eliminator batt; 7 years' service; pH, 7.4; Cl_2, 0.1 p.p.m. residual. Fig. 5.

DELAMINATED SECTION of seriously degraded wood, showing laminae of springwood and loss of summerwood due to internal biological deterioration. Summerwood is attacked first. Fig. 6.

ly of chemical origin resulting in a white fibrous surface on the wood; (Figs. 1a and 1b).

2. Biological action; preceded by the same chemical degradation that produces (1) but evidenced by a brash, crumbly surface condition (Fig. 2).

Internal deterioration . . . The second group, usually found **internally** within the wood, is the result of fungal action probably preceded by chemical degradations similar to those which accompanied or preceded the surface types, resulting in a brash, delaminated or crumbly condition in the interior of the piece (Fig. 3).

Chemical surface attack leaves a coating of white fibers on the surface of the wood. It can be recognized by both the color and the finely divided fibrous texture. The color alone cannot be used as a criterion, because thin scales of salts on the surface often produce a white color. The distinctive fibrous surface must be evident to classify the deterioration under this heading.

A chemical analysis of this type showed that the lignin had been removed to a greater extent than any other single component of the original wood. The extractive content was reduced to a greater extent than the cellulose and to a lesser extent than the lignin. The possibility of this condition being the result of organic action was considered. Fungi are known which remove lignin selectively and they have been found in wood specimens from cooling towers, but they are not known to produce the usual appearance of this form of deterioration. These fungi usually operate in small pockets, leaving a cellulose residual.

No cases are known in which they leave a deep bed of cellulose fibers over an entire surface, as is shown by typical examples of this type of deterioration. It was felt that this type was more likely of chemical origin. A certain amount of such attack is unavoidable due to the leaching action of cooling-tower waters which apparently increases with greater alkalinity as evidenced by higher pH values.

A review of the chemistry of wood indicates that lignin can be removed by treatment with highly alkaline solutions. It is also known that lignin may be removed selectively by oxidizing agents. It is further known that alternate treatment with alkaline solutions and an oxidizing agent will produce very rapid lignin degradation. In cooling towers, the pH of the circulating water is not usually high enough to qualify as a highly alkaline solution. Chlorine is the

Why This Report . . .

EARLY in 1950, several of the redwood-lumber manufacturers and cooling-tower manufacturers were advised that rapid and serious deterioration was occurring in redwood cooling towers in the Gulf Coast area. Samples of wood from these towers were examined by several redwood suppliers and cooling-tower manufacturers and by the California Redwood Association.

It was apparent from these samples, and from reports received from cooling-tower users, that different types of deterioration were occurring. It was also apparent that specific causative factors involved in the deterioration were not readily apparent.

Representatives of the Cooling Tower Institute and the California Redwood Association met with a group of tower users in Houston on July 27, 1950. All present agreed to work together in an effort to clarify the situation and answer the problem if possible. The facilities of the U. S. Forest Products Laboratory and of the Institute of Paper Chemistry also were to be utilized.

This report is a summary of the work done and conclusions reached to date as a result of this joint study.

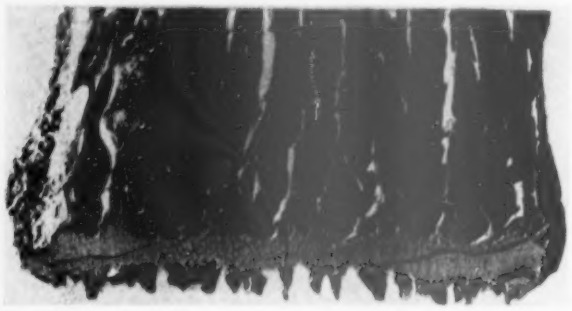
Conclusions presented herein are based primarily on, and are limited to, a statistical analysis of data obtained from the direct examination of 103 operating cooling towers in the Gulf Coast area extending from Brownsville to Baton Rouge. The towers surveyed included all commercially available types and designs ranging in age from a few months to 22 years and confined in size to what may be considered industrial towers.

These studies have been in progress for approximately 2 years and the scope of this report is limited to the analysis of the data obtained during the summer of 1951. As a result it is important that full cognizance be taken of the limited amount of information accumulated and that all conclusions derived therefrom are tentative and subject to further refinement or revision as more and better data are obtained in further studies now in process.

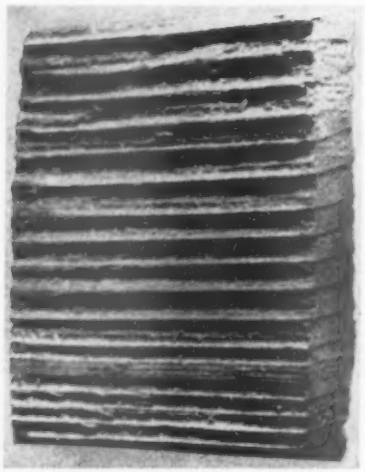
The studies of the committee have also included the installation of a series of test panels containing various woods treated respectively with several chemical agents which may offer possible methods of reducing deterioration. Since the results to be obtained from this test program are necessarily long range, this report does not contain any conclusions derived from the test-panel installations.

SURFACE BIOLOGICAL ATTACK of relatively mild intensity. Fig. 7a.

MODERATE INTENSITY of attack due to surface biological deterioration. Fig. 7b.



SEVERE ATTACK due to surface biological deterioration. Biological attack, where it appears at all, shows approximately a straight-line correlation with age. Severity of attack in older towers may be underestimated. Fig. 7c.



SPECIFIC ELIMINATOR BATT shows fuzzy external condition resulting from surface chemical degradation after 10 years of continuous service in tower operating at general pH of 9.0. System was chlorinated for algae control. Fig. 8.

ADVANCED STAGES of internal infection may be detected by thumb pressure on the surface. The severe internal biological degradation is due solely to fungal action. Both delamination and complete loss of strength occur. Fig. 9.

principal oxidizing agent present, and is not usually present in sufficient concentration to produce rapid lignin removal.

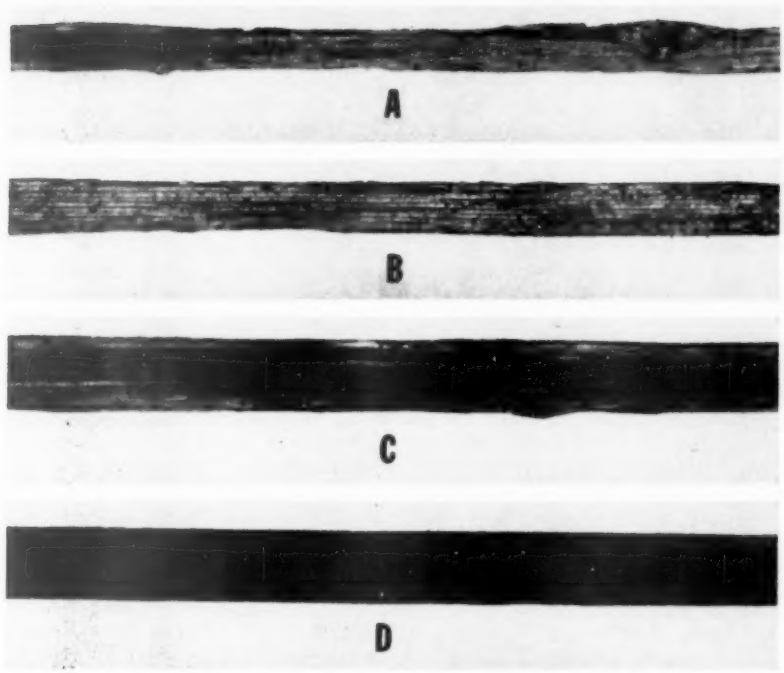
However, in cooling tower operation, extremely long periods of time are involved. The reactions need not be rapid to produce an end result. It has been observed that this type of deterioration becomes particularly severe if circulating waters with high pH are used in which cases the surface concentrations of alkaline materials are likely to be high. Further support to the hypothesis that this type of deterioration is primarily the result of chemical action is furnished by reports of tower operators to the effect that this condition can be produced very rapidly by increasing chlorine residuals, indicating that careful control is necessary.

It has been further observed that the condition becomes particularly severe if chlorine residuals above 1 p.p.m. are maintained in waters with a high pH. The fact that the toxic extractives normally in redwood that render it resistant to decay are reduced by this type of degradation should be stressed, since it has a bearing on the next type of deterioration to be discussed.

Chemical deterioration is closely related to the composition of the water and the probable incidence of attack may be predicted from the water analysis. Field observations indicate that this type of deterioration is apparently highest in intensity in the parts of the tower which are subjected to flowing water and in those air inlet areas in which drops of water splashing out onto louvers evaporate completely to a dry condition, mechanically disintegrating the wood as crystals form beneath the surface. (Fig. 4.)

Biological surface attack . . . This form produces a crumbly surface on the wood, not unlike the residue of the brown rots and is probably preceded by chemical degradation. It usually can be recognized by the finely divided crumbly texture of the wood. Color alone cannot be used as a criterion for classification since certain water contaminants, such as oil, will produce the brown color.

The texture of the surface and brashness of the wood should be considered. A chemical analysis of this type of deterioration shows that cellulose has been removed selectively. The extractive content has also been re-



THESE DECK BATT DETERIORATION samples were taken from three elevations of the same tower after 9 years' continuous service. A is from upper deck level; B is from central flooded area; C is from lower level; D is unused material. Fig. 10.

duced to approximately the same level found in chemical surface attack. This type of attack could not be positively qualified as solely chemical in effect since a study of numerous water analyses failed to show any chemical conditions which would remove cellulose selectively. Samples of this brash lumber which exhibited this type of deterioration were taken from several towers in one plant and cultured, the cultures purified and studied.

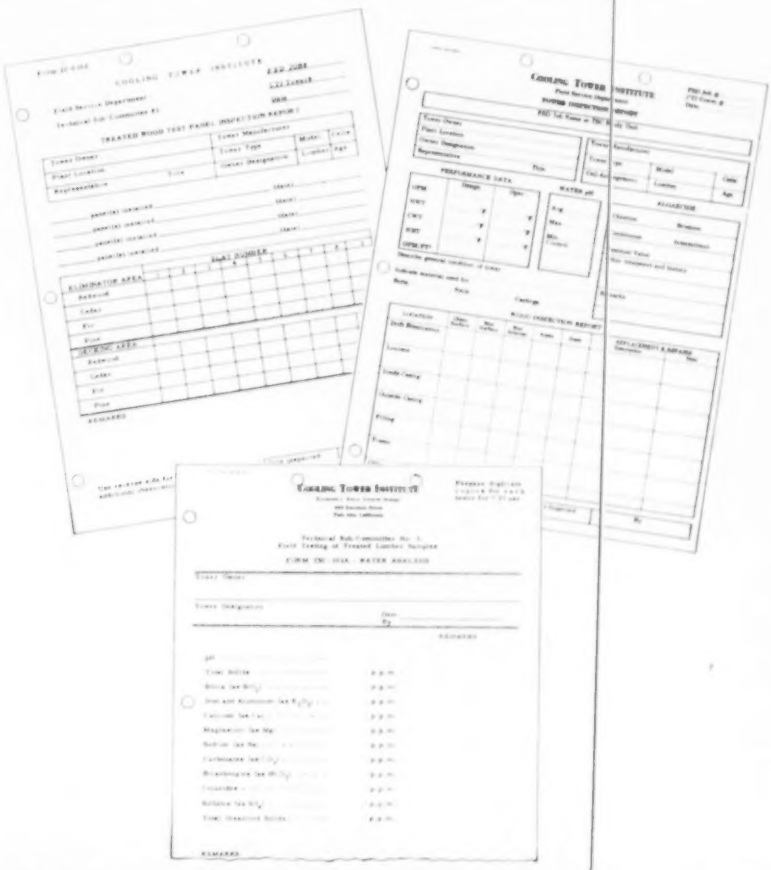
A number of bacteria were isolated as well as a number of fungi. All were checked for their ability to utilize cellulose as their sole source of carbon. None of the bacteria were able to do so, but a number of the fungi showed that they could take their carbon from cellulose. These were then transplanted to redwood, and a considerable number showed that they could live, using redwood as their sole source of carbon. Since no chemicals which might remove cellulose selectively were known to be present, and since fungi were found to be present which could attack redwood, it is concluded that this type of deterioration represents the end result of fungal action, although the detailed mechanism involved or the specific organisms principally responsible have not yet been established.

The attack may result in a reduction in size or it may produce a porous, corky surface. Several characteristics may be used to differentiate between chemical and biological attack in the flooded portions of a tower with a fair degree of accuracy, but mycological examination is necessary to make a positive distinction between the two. The microorganisms usually penetrate the wood and do some damage throughout the piece. This results in a reduction in structural strength, producing a brittle condition referred to in wood technology as brashness. This condition may be rather easily identified by breaking a piece of wood and noting the fracture.

Normal wood breaks with a series of fractures, accompanied by splitting along the grain. The splitting disappears with brashness and the failure becomes a single fracture squarely across the grain.

Internal biological attack . . . This term has been applied to the deterioration occurring within the wood. It is observed as occurring under the surface, often leaving a sound shell of wood. (Fig. 5.) The degraded wood is normally light brown in color, and the wood crumbles to a brown powder on handling. In the early stages, the affected wood is often delaminated, the laminae corresponding to the annual

(Continued on page 110)



ANNUAL INSPECTIONS on 103 towers in this survey include test panel report, water analyses, and tower report.

Treating Cooling-Tower Lumber

. . . to reduce fungal decay

by R. H. Bescher

ATTENTION has been focused recently on abnormal decay of cooling-tower lumber which leads to costly maintenance *(The Oil and Gas Journal, September 21, 1953, page 343)*. Many factors have been considered as basic causes for early removal of wooden parts from cooling towers.

What is causing the early removal of the wooden portions of cooling towers? Is it erosion of the wood, that is, the wearing away of the surface of the wood, particularly the springwood, until the wooden member is thin and must be replaced? It is generally agreed that while there is some erosion in cooling towers, very few of the wooden members must be replaced because they are worn.

Delignification . . . Is early removal of wooden parts from cooling towers due to delignification? The Institute of Paper Chemistry states that, "Although chlorine in considerable concentrations is an effective delignifying agent and strong alkalies are used at elevated temperatures for pulping wood by delignification, there is no clear evidence that either chemical can affect delignification under conditions of cooling-tower use, or that true delignification actually occurs as a prevailing type of deterioration."[3] Their report further shows that decayed wood actually contains a greater percentage of lignin than does sound wood. This enrichment of the lignin comes as a result of the removal of the cellulose by decay organisms.

Author is technical manager, wood processing division, Koppers Co., Inc.

Leaching action . . . Is the deterioration of wooden parts in cooling towers due to leaching action of the cooling water? All wood is composed of three basic parts: (1) Cellulose fibers which give the wood strength; (2) lignin, an adhesive substance, which holds the fibers together; and (3) water-soluble extractives. The extractives impart decay resistance, color, odor, and taste. They do not add strength to the wood. If the extractives contributed to the strength of wood, then the heartwood of a species should be stronger than its sapwood and this is not true provided both have the same density. According to the Forest Products Laboratory, "The extractives of redwood have been shown to be toxic to wood-destroying fungi and are therefore believed to be responsible for its natural resistance to decay."[4] It therefore seems reasonable to conclude that whether or not wood in cooling towers has been leached it is of importance only as it may reduce natural protection against decay.

Chemical attack . . . Is wood being removed from cooling towers because of chemical attack? Chemical attack is generally referred to as the reaction between wood substance and the cooling-water impurities, such as chlorine, alkali, iron, and other salts. Normal amounts of chlorine and alkali accelerate the rate at which extractives are removed from redwood. Further, it has been shown that iron salts "may precipitate toxic extractives of a number of naturally durable species and thus render the wood vulnerable to decay."[5] However, in all of these cases the effect is a reduction in the decay resistance of the wood. It has no direct effect upon the wood itself as far as strength is concerned. Under poorly controlled water conditions, where high pH and/or residual chlorine was maintained, wood in cooling towers has been destroyed by chemical attack. The surface of the wood was eroded and pulp-like wooden fibers were found on the screens.

Fungal decay . . . Is wood failing prematurely in cooling towers because of decay? The Institute of Paper Chemistry collected samples from cooling towers from which they obtained a total of 145 fungal isolates. Ninety-five of these fungal isolates have cellulolytic properties, that is, can utilize cellulose as a source of carbon. To determine the ability of these isolates

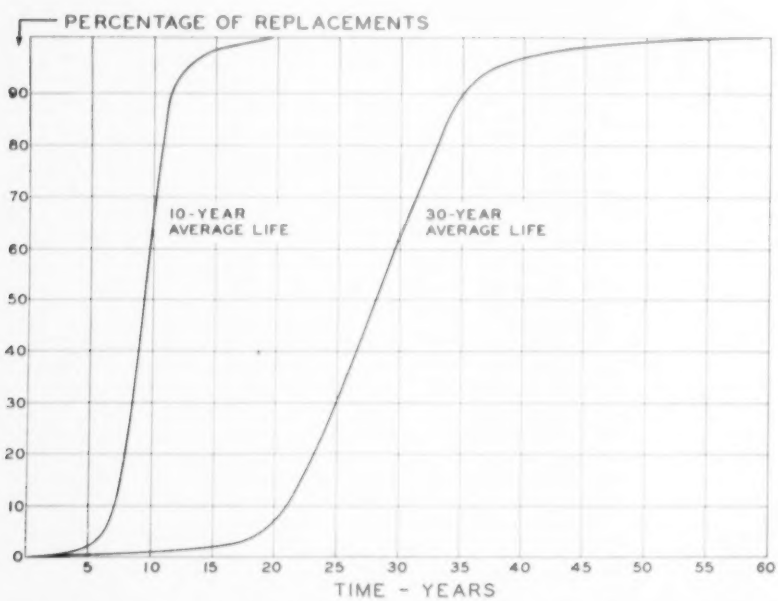


Fig. 1—Percentage of replacements of materials. Average service lives of 10 and 30 years.

to grow on redwood, both leached and unleached disks were inoculated with the fungal isolates which showed cellulolytic activity. The "results show that 81 of the isolates obtained from redwood cooling towers grew on both the leached and unleached redwood disks."[6] This work proves that a large number of fungi can cause decay of redwood in cooling towers. The institute's work and work at the Forest Products Laboratory indicated that the removal of extractives from redwood increases the rate at which fungi attack the wood.[4 5 6]

A careful review of all the published data and inspection of cooling towers indicate that untreated redwood is a reasonably economical material for use in natural-draft cooling towers; but this is not true with forced and induced-draft towers because of early removal of wooden parts as a result of decay.

Life expectancy . . . Unfortunately, the life expectancy of any two pieces of lumber, as far as decay is concerned, is not the same. Service life is based on a probability curve, similar to a life-expectancy curve for people. Fig. 1 is a probability curve for wood replacements. It will be noted from this curve that for material having an average service life of 10 years, major repairs will be necessary after 6 to 7 years. Thus, to have a wood structure which will be relatively free of maintenance for 20 years, it is necessary to use a material having an average 30-year service life.

Pressure impregnation . . . The cost of pressure impregnation is quite reasonable. One cell of a cooling tower will cost approximately $20,000. It contains approximately 20,000 bd.-ft. of wood. The cost of pressure impregnating the wood with 10 lb. of creosote per cubic foot is about $60 per thousand board-feet, or $1,200 per unit. With an estimated life of 10 years for untreated redwood cooling towers and an initial investment of $20,000, the annual cost amortized at 4 per cent would be $2,465.82.[7] With an additional investment of $1,200 for pressure creosoting, the annual cost for an estimated 30-year life would be $1,226. This is an annual saving of $1,239.82 which is a return of 103.3 per cent per year on the $1,200 investment.

As further indication that the $1,200 investment is small for value received, the treated structure need last but 9 months longer than the untreated structure to pay for the cost of treatment. Extra service beyond this period would represent profit on the $1,200.

From considerations of all points it appears that pressure impregnating of cooling-tower lumber with a retention of not less than 10 lb. per cubic foot of American Wood Preservers' Association creosote, in accordance with American Wood Preservers' Association standards for pressure impregnations should be a solution to the premature failure of wooden parts in cooling towers. Creosoted aquaducts carrying water for human consumption, irrigated, and power-plant use have given satisfactory service for many years without imparting taste, odor, or scale-forming properties to the water.[8] The preservative value of creosote is known to be unaffected by chlorine; in fact, chlorination or aromatic chemicals similar to those contained in creosote actually increases their effectiveness against wood-destroying fungi. It appears true that removal of wood from cooling towers is made necessary primarily because of the action of decay organisms. In all known cases where an installation is subject to failure through decay, pressure impregnating of the wood with creosote has greatly increased its life.

A specification covering pressure treatment of cooling tower lumber is:

"Completely fabricated redwood lumber, having a moisture content not exceeding 40 per cent, shall be pressure impregnated with 10 lb. per cubic foot of creosote meeting the requirements of American Wood Preservers' Association PI-52 except that residue above 355° C. shall not exceed 25 per cent. It shall be impregnated in accordance with American Wood Preservers' Association Specification C2-51 as given for Pacific Coast Douglas Fir Lumber. Material removed from the treating cylinder shall be free of liquid exudation."

COST COMPARISON OF PRESSURE CREOSOTED VERSUS UNTREATED REDWOOD COOLING TOWER

$20,000.00 = Cost of untreated cooling tower.
$0.1232909 = Annual cost per dollar invested at 4 per cent over 10-year period.[7]
$0.0578301 = Annual cost per dollar invested at 4 per cent over 30-year period.
$1,200.00 = Cost of pressure creosoting.

$20,000 × $0.1232909 = $2,465.82 annual cost of untreated tower (10-year average life).
$21,200 × $0.0578301 = $1,226.00 annual cost of pressure creosoted tower (30-year average life).
$1,239.82 annual savings.

$$\frac{\$1{,}239.82 \times 100}{\$1{,}200.00} = 103.3 \text{ per cent return per year on the \$1,200 investment.}$$

To determine the additional length of time the treated structure must last to pay for the cost of treatment use the following formula:

$$N = \frac{\text{Log}\,[A/(A - PR)]}{\text{Log}\,(1 + R)} \qquad \text{(Ref. 7)}$$

Where:
N = total years service
A = annual cost for the untreated structure
P = first cost of treated structure in place
R = rate of interest

$$N = \frac{\text{Log}\,\dfrac{\$2{,}465.82}{(\$2{,}465.82 - \$21{,}200 \times 0.04)}}{\text{Log}\,(1 + R)}$$

N = 10.75 years total service

10.75 — 10.00 = 0.75 years or 9 months. The treated structure must last but 9 months longer than the untreated structure to pay for the cost of treatment.

References

1. "Wood Deterioration in Cooling Towers," R-50-W-1, by D. R. Baker, engineering research division, Marley Co., Inc., Kansas City, Kans., p. 2.
2. "Controlling Deterioration of Cooling-Tower Lumber," by D. R. Baker, Marley Co., Kansas City, Kans., p. 3.
3. Study of Deteriorated Specimens from Redwood Cooling Towers, Project 1561, Progress Report 3 to the California Redwood Association, November 1, 1952, p. 6.
4. "Deterioration of Wood in Cooling Towers," by R. H. Baechler, Chemist, and C. Audrey Richards, pathologist, Forest Products Laboratory, Madison, Wis., p. 2.
5. Same as (4), p. 5.
6. Study of Deteriorated Redwood Specimens from Cooling Towers, Project 1561, Progress Report 3 to the California Redwood Association, November 1, 1952, p. 56.
7. "Wood Preservation," by Hunt and Garratt, Table 17, p. 277.
8. Wood Preserving News, September 1925, p. 126; May 1925, p. 70, 71; October 1930, p. 142; December 193[illegible], p. 163.

A MAJOR OIL FIELD in the Big Horn basin of Wyoming, Hamilton Dome has produced about 29 million barrels during the past 35 years.

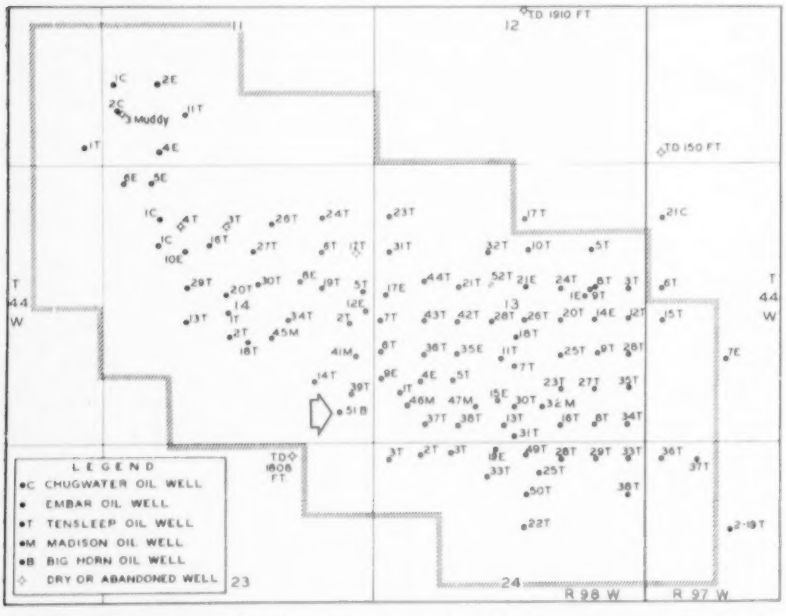
New Pays Stimulate Hamilton Dome Production

Embar-Tensleep producing most of field's 11,000-bbl. per day output

by Joseph A. Kornfeld
District Editor

RECOMPLETION of old wells in successively deeper oil horizons has kept crude-oil production from Hamilton Dome field in the Big Horn basin of Wyoming at its current high level of 11,000 bbl. per day, after 35 years of oil history.

The bulk of this production comes from the Embar-Tensleep formations from which 94 oil wells account for nearly 10,000 bbl. per day out of the field total produced from 105 wells. Last month, a new and deeper oil pay was found on top of the dome from the Ordovician Big Horn dolomite which completion adds to the field's productivity and reserves.



LATEST PAY DISCOVERY at Hamilton Dome—the Ordovician—is indicated on field map. Arrow points to Argo Oil Corp. 51B Placer, C SE SE 14-44n-98w, which is pumping 384 bbl. of 14°-gravity oil and 109 bbl. of water per day from 3,542 ft. (Fig. 1).

Location . . . Hamilton dome lies in the southwestern portion of the Big Horn basin about 20 miles west-northwest of the town of Thermopolis, Wyo. This fold lies on the north side of Owl Creek valley in Hot Springs County and the topographically high part of the dome coincides with the structural high. Well elevations average 5,550 ft. above sea level.

Field Development

Discovery oil well of Hamilton Dome field was completed in the summer of 1918 when the Empire State Oil Co. 1 Government, SW SW 13-44n-98w, was completed from 1,445 to 1,500 ft. in the Triassic Curtis sand for an initial production of 20 bbl. of 22.7°-gravity oil per day.

The following year, oil was discovered in the Embar formation at 2,460 ft. in NE SE Section 14. From 1920 through 1922, a drilling campaign was conducted in this field during which 17 wells were completed from the Embar reservoir; initial production rates varied from 20 to 450 bbl. of oil per day per well. Little additional development took place until World War II, except for spasmodic drilling from 1923-25 and from 1934-35.

Tensleep development . . . First com-

Field Statistics . . . Hamilton Dome

METHOD OF EXPLORATION: Surface geology.

DATE OF FIELD DISCOVERY: September 1918.

DATE OF FIRST OIL PRODUCTION: October 1918.

DISCOVERY OIL WELL: No. 1 Government, SW SW 13-44n-98w, completed from 1,445 to 1,500 ft. in the Curtis oil sand in the middle portion of Triassic Chugwater red beds in September 1918.

WELLS:

Chugwater (Curtis sand)	5
Phosphoria (Embar) limestone	16
Tensleep sandstone	78
Madison dolomite	5
Big Horn dolomite	1
Field total, oil wells (November 1, 1953)	105

Deepest well drilled: Argo Oil Corp. 51 Placer, C SE SE 14-44n-98w, TD 4,929 ft. in pre-Cambrian rocks. This well was plugged back to 3,542 ft. and completed as the discovery well of the Ordovician Big Horn limestone oil reservoir.

WELL SPACING: Oil wells: acres per well 10

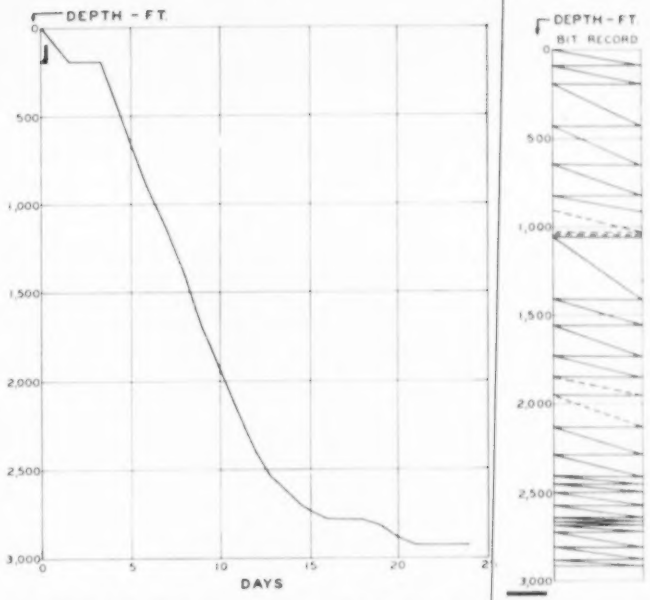
PRODUCTION:

Daily average oil production (October 1, 1953), bbl.	11,000
Cumulative oil recovery (to September 1, 1953), bbl.	28,862,763
Average produced oil gravity, °A.P.I.	14 to 26

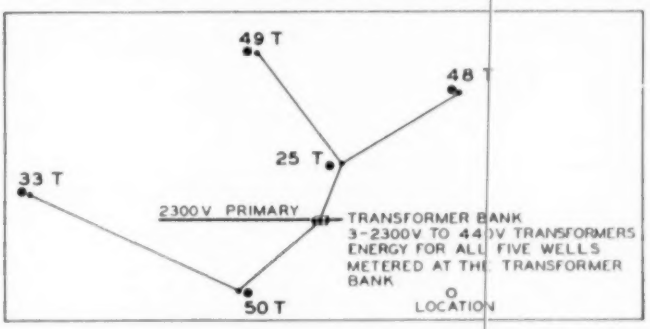
MARKET OUTLET: Service Pipe Line Co. and Hamilton Pipe Line Co.

OPERATORS: Argo Oil Corp., H. O. Batzer Co., Empire State Oil Co., and Westates Petroleum Corp.

NUMBER OF ACTIVE DRILLING RIGS (October 1, 1953) 2



PENETRATION CURVE of a typical Tensleep sand completion finaled at 2,390 ft. is shown at left. Accompanying bit record appears at right. (Fig. 2).



SECONDARY POWER-DISTRIBUTION PLAT of Power Bank No. 1 serving five wells in south end of field. (Fig. 3).

mercial production from the Tensleep reservoir was obtained in August 1929. The discovery well, drilled in NE NE SW Section 14, produced 188 bbl. of 20°-gravity oil per day; however, this well was plugged back successively to the Embar and Tensleep formations. Since 1943, development of this reservoir has been steady, and the Tensleep now comprises the most important pay in this field.

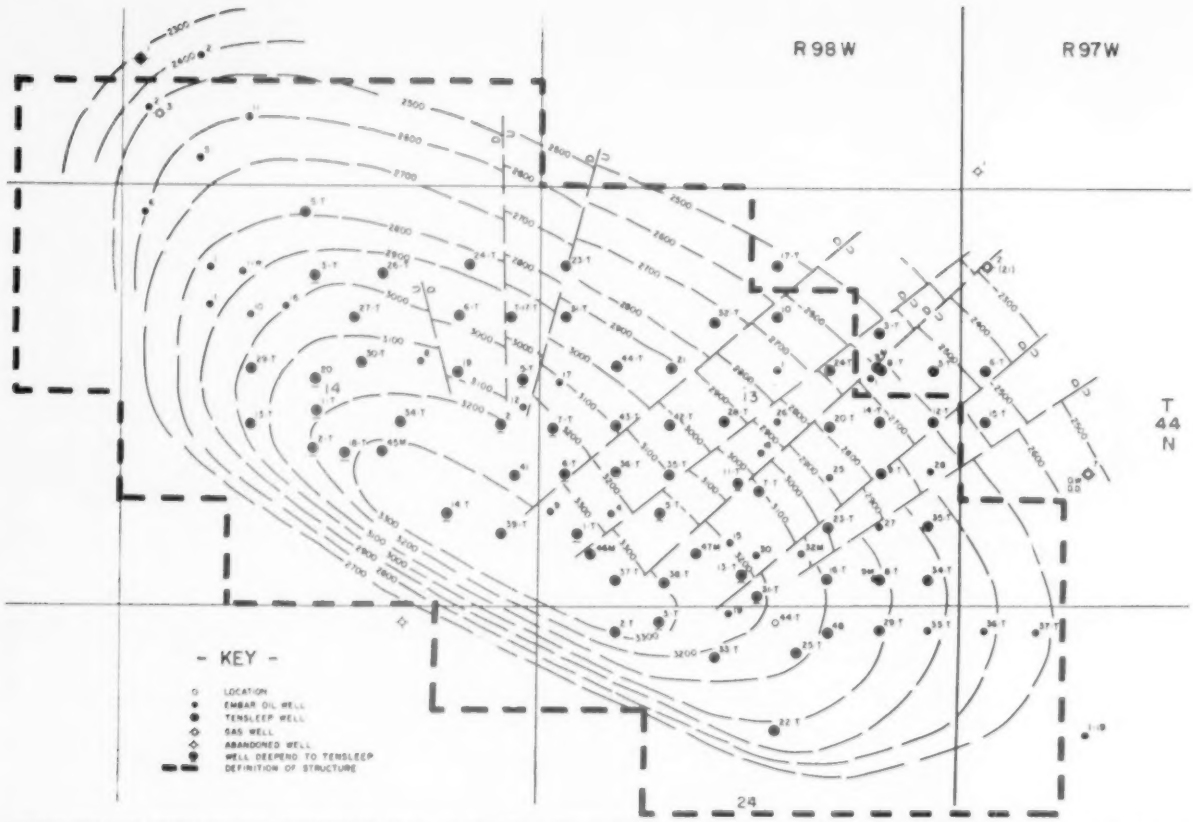
Madison development . . . Deeper production was found at Hamilton Dome during 1948 with completion of Argo Oil Corp. 41-M Placer, SE NE SE 14-44n-98w, from the Madison limestone of Mississippian age. This well swabbed 14.5°-gravity oil at the rate of 25 bbl. per hour. Four additional oil wells have been completed from the Madison reservoir to date.

At the present time, oil is being produced from the Triassic Curtis sandstone (Chugwater formation), Permian Phosphoria limestone (Embar formation), Pennsylvanian Tensleep sandstone, the Mississippian Madison limestone and the Ordovician Big Horn dolomite. Of the field total of 105 oil wells, 78 are producing from the Tensleep, 16 from the Embar, 5 from the Madison, 5 from the Chugwater, and 1 from the Big Horn dolomite.

Cumulative recovery from this field to September 1, 1953, was 28,862,763 bbl. of oil. An extraordinary field, it is believed that the recoverable reserve may surpass the amount already produced. During 1953 withdrawals averaged 11,000 bbl. per day for the field or slightly more than 100 bbl. per well per day. Produced oil gravities range from 14° to 26° A.P.I. Known geological structure at Hamilton dome comprises 2,040 acres most of which acreage is in the proved developed status.

DIAMOND-CORING PERFORMANCE IN PRE-CRETACEOUS FORMATIONS, HAMILTON DOME FIELD, HOT SPRINGS COUNTY, WYOMING

	No. cores	Interval	Total ft.	Recovery		Coring performance		Weight on bit (lb.)	Rotary table speed (r.p.m.)	Pump pressure (psi.)	Fluid volume (g.p.m.)
				Ft.	Per cent	Hours	Ft./hr.				
Chugwater	12	1,137-2,038	585	560	96	101	5.8	4,000- 8,000	40-60	275	160
Embar	4	2,222-2,369	101	74	73	29	3.48	4,000- 7,000	45-65	325	170
Tensleep	2	2,490-2,592	100	100	100	30	3.33	6,000- 9,000	45-65	350	170
Madison	2	3,410-3,422	12	12	100	6.5	1.85	4,000-10,000	40-70	400	160



SUBSURFACE STRUCTURE CONTOUR MAP of Hamilton Dome prepared on top of Permian Embar limestone. This drawing depicts a group of radial step faults intersecting basinward flank of asymmetrical anticline. (Fig. 4).

Drilling Practices

Drilling conditions at Hamilton Dome are not especially difficult, although an average of 26 bits are used to drill the Tensleep wells to approximately 2,900 ft. Bits used range from hard-shale to hard-rock bits.

A 12-in. hole is drilled to a depth of 200 ft. and then reamed to 14¾-in. where 10¾-in. surface pipe is landed and cemented to the surface.

The guide shoe is drilled out with a 9-in. bit, and this hole size is maintained until the top of the Tensleep sand or saturated Madison lime is reached. At this depth the 7-in. production string is landed, utilizing a guide shoe and float collar and cemented with approximately 300 sacks.

The float collar, cement, and shoe are drilled with a 6⅛-in. bit and a 6⅛-in. hole is carried through the saturated section and the well is completed in open hole by swabbing through 2⅞-in. o.d. tubing. Depending upon the formation in which the well is to be completed, the general practice in the past has been to (1) set pipe on top of the Embar and then drill 50 to 60 ft.; (2) set pipe on top of the Tensleep and drill approximately 200 ft. into the Tensleep; (3) drill approximately 225 ft. into Madison and set pipe, and then drill 200 ft. into the saturated Madison section, and complete all wells in open hole.

Number of drill collars utilized in drilling wells at Hamilton Dome varies with the individual contractor and in number. Field practice calls for running from six to fifteen 6¼-in. drill collars all placed at the bottom of the string. No great trouble is encountered above the Madison in maintaining a hole with a deviation from the vertical of less than 5°, but upon penetrating the Madison the hole has a tendency to deviate from 5° to 10°.

Sodium-bentonite-base muds are used from the surface to total depth with 10 to 15 per cent oil. Lost circulation is encountered in varying degrees in the Lakota, Embar, and Tensleep formations, but the circulation can be regained without excessive trouble by using bulk materials (cottonseed hulls, sawdust, etc.).

Lost circulation of a more severe nature has been encountered in the basal Madison which is highly fractured and contains many large caverns. Bulk materials such as cottonseed hulls, sawdust, fiber, cell flake, burlap sacks, sage brush, cement, cal seal, etc., have been used but with little success. Mud properties carried are:

Weight: 9.5 lb. per gallon.
Viscosity: 45-50 seconds A.P.I.

Water loss and filter cake offer no problems.

Diamond Coring

A few key wells have been selected to diamond core saturated sections of the Chugwater sands, Embar-Tensleep, and Madison formations for reservoir, correlation, and evaluation purposes. Table I summarizes recent diamond-coring experience by formations.

Excellent coring performance of as high as 5.8 ft. per hour has been obtained in the Triassic Chugwater formations. Weights on bit employed vary from 4,000 to 8,000 lb. and fluid volumes were 160 g.p.m. circulated under a pump pressure of 275 psi.

This section is comprised of highly fractured and extremely cherty limes and dolomites; this lithology is therefore conducive to poor core recoveries and damaged diamond heads. Penetration rates of 3.48 ft. per hour were obtained in a 101-ft. section cored in the Embar while employing weights on bit of from 4,000 to 7,000 lb. and circulating fluid volumes of 170 g.p.m. under a pump pressure of 325 psi.

Similarly good performance of 3.33 ft. per hour were obtained in diamond-coring 100 ft. of Tensleep section while

using weights on bit of from 6,000 to 9,000 lb. and circulating fluid volumes of 170 g.p.m. under a pump pressure of 350 psi. Recoveries were 100 per cent in the Tensleep compared with only 73 per cent obtained from the Embar.

Low penetration rates were reported from limited diamond-coring performance data in the Madison limestone formation despite 100 per cent recoveries. Core performance of only 1.85 ft. per hour was logged during the cutting of two cores totaling 12 ft. which required 6.5 coring hours. Weights on bit ranged from 4,000 to 10,000 lb. and slightly higher pump pressures of 400 psi. were used in circulating 160 g.p.m.

Conventional electric logs are run on all wells before the production string is landed. No additional logging is done although a few key wells have been logged using the gamma ray-neutron log for correlation and evaluation purposes.

Big Horn . . . A new oil reservoir for Hamilton Dome was discovered during October 1953 marking the deepest production found in the field to date. Drilled on the highest closure on the structure, Argo Oil Corp. 51 Placer, C SE SE 14-44n-98w, the discovery, swabbed about 500 bbl. of 14°-gravity oil per day from a plug-back depth of 3,542 ft. in the Ordovician Big Horn limestone. This well was originally drilled to a total depth of 4,929 ft. in pre-Cambrian rocks. Discovery of oil from the Big Horn limestone at Hamilton Dome marks the first commercial production found in the Ordovician system in Wyoming.

Drilling Rigs

Carpenter-Trant Drilling Co., Denver, used its Rig 6, adapted for drilling to depths of about 5,000 ft., to drill this well and this equipment is considered typical of those rigs employed in drilling developmental wells to the Tensleep.

On the southwest flank of the dome, Argo Oil Corp. is drilling below 884 ft. at its 55T Government, NW SW SE 14-44n-98w. Well is ⅜ mile west of the firm's 51B Government, recently completed Ordovician pay discovery well.

Production Practices

All wells in Hamilton Dome field are pumping wells. During the early life of the field, the wells were pumped with rod lines from a central power system. As deeper horizons were developed and oil rates increased, individual pumping units powered by natural-gas engines were employed. As the number of wells in the field increased, it became evident that the very low gas-oil ratio would not supply a sufficient amount of gas for operations and the field was electrified in the late 1940's.

Electrification . . . Service is taken at individual transformer banks which drop the primary voltage of 2,300 volts down to 440 volts for secondary distribution to 10 or 15-kva. motors situated at each well. A typical lease layout of a secondary power distribution is shown in an accompanying drawing taken at No. 1 Power Bank in the north half of Section 24-44n-78w, on the south side of the field.

Use of capacitors has improved power factor from an average of 0.6 to 0.95 at peak loads. Time delay automatic restarts have been installed on key wells.

Crude treating . . . Crude is treated to pipe-line requirements of 0.2 per cent b.s. and w. through use of low-pressure vertical treaters, circulating heaters, and steaming operations. Use of treaters, however, is replacing the latter two methods for crude-oil treating.

In some cases, where high water production is encountered, free-water knockouts have been used in the treating installation. Chemical treatment is required in most cases to prepare the crude oil for shipment. Where treaters are used in the treating system, chemical-to-crude ratios of 1 qt. to 400 bbl. are not uncommon.

Typical lease-storage installations in the field employ low 500-bbl. tanks with an average storage capacity of 4,000 bbl. in each tank battery. Although small quantities of hydrogen sulfide are present in the crude, no special precautions have been considered necessary except in a few isolated cases.

In general, producing operations at Hamilton Dome are characterized by unusual trouble-free operations. Many wells in the field have been operated for periods of 5 or more years without requiring pulling.

TYPICAL FORMATIONAL SEQUENCE, HAMILTON DOME FIELD, HOT SPRINGS COUNTY, WYOMING

(Argo Oil Corp. No. Placer 32-T, Surface Elevation 5,598 kb., 5,589 Ground)

Geologic formations—	Tops logged at (ft.)
Cretaceous:	
Frontier	On surface
Mowry	150
Muddy	497
Thermopolis	570
Dakota	792
Fuson	873
Lakota	1,003
Jurassic:	
Morrison	1,047
Sundance	1,142
Gypsum Springs	1,523
Triassic:	
Chugwater	1,652
Dinwoody	2,768
Permian:	
Phosphoria (Embar)	2,851
Pennsylvanian:	
Tensleep	3,040
Amsden	3,355
Mississippian:	
Madison	3,585
Devonian:	
Three Forks	4,085
Ordovician:	
Big Horn	4,105
Cambrian:	
Gros Ventre, Gallatin, Flathead	Approx. 1,150 ft. thick.

Geological Structure

Hamilton dome is a local feature on the Thermopolis anticline in the southern part of the Big Horn basin. Thermopolis anticline, which extends for a length of 30 miles slightly north of west through the town of Thermopolis, exhibits a steeply dipping south flank and a gentle north flank. On this elongate feature, Hamilton dome exhibits dip on its south flank ranging up to 90° and on the north flank from 12° to 14°.

Hamilton dome is a basinward fold and minor folding occurs between it and the central deeper portion of the Big Horn basin. This dome is arcuate with the convex bend to the south.

Structural closure ranges from 2,000 ft. at the east end of the dome up to 3,500 ft. on the south towards the mountain uplift.

Thermopolis shale covers the crest of Hamilton dome and the Frontier and Mowry formations encircle the fold.

An interesting feature of Hamilton dome folding is the vertical coincidence of the structural axes on the various horizons. Folding is the result of vertical uplift and tilting over a large fault in the basement complex and sediments on the steep flanks are attenuated particularly in the less competent shale beds; therefore, there has been little shifting of the vertical component of the axis with depth. Current search for Cambro-Ordovician potential reservoirs are therefore made within the highest closures on the Embar or Tensleep markers.

Acknowledgment

Acknowledgment is made to Argo Oil Corp. through whose cooperation this article was made possible. Particular thanks are due to W. L. Shaffer, Jr., and R. S. Padboy, petroleum engineers.

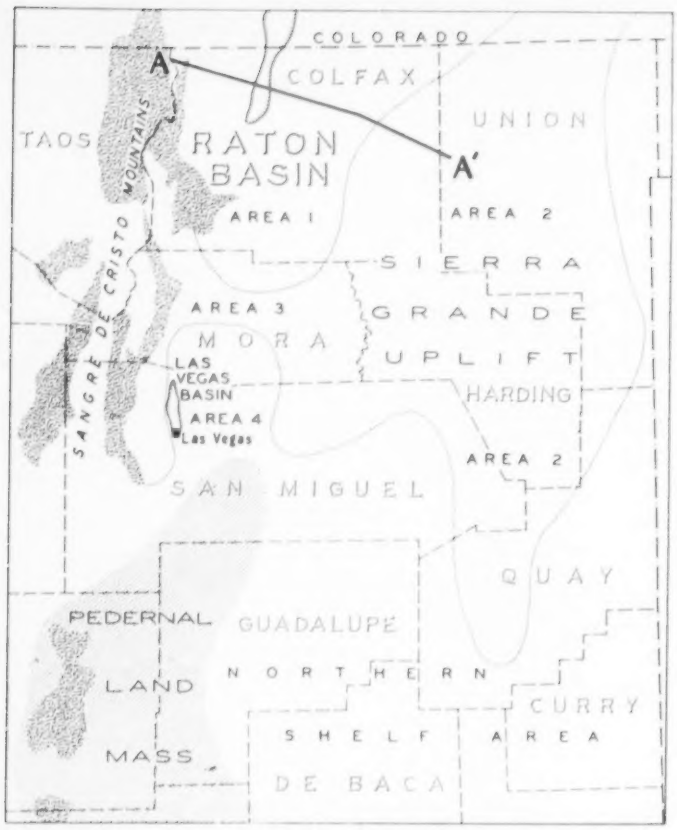


Fig. 1—Sketch map showing the 5,000,000-acre area discussed in this article. Line A-A' locates cross-section of Fig. 3.

Physiographic Provinces of Northeastern New Mexico

1. On the west edge of the area under discussion, lie the Sangre de Cristo Mountains composed of a series of north-south trending igneous ridges or hogbacks with sharply east-dipping sedimentary beds lying on the east flank of the mountain range. Elevations range from 6,500 ft. to some 13,000 ft. on the central ridge.

2. In the central portion of the area, lies the Meadows area which lies to the east of the Sangre de Cristo Mountain Range, characterized by high meadows and flat land breaking off into the Canadian River basin.

3. On the eastern portion of the area exist the Sierra Grande arch and the Ogallala mesa. The Sierra Grande arch is marked by high peaks, extinct volcanoes, and numerous lava flows. The Ogallala mesa lying on the east edge of the Sierra Grande arch area is a flat level plains area with no apparent change in character.

4. To the north central portion of the area lies the Raton mesa, a highly dissected mesa lying off the western side of the Raton basin, bounded on the west by the Sangre de Cristo Mountains, and on the east by the Sierra Grande arch.

by Phil D. Helmig

What are the

Petroleum Possibilities of Northeast New Mexico?

THE major structural features now in existence in Northeast New Mexico are (1) the Raton basin, lying in the north-central portion of the area; (2) the Sangre de Cristo Mountains on the west; (3) the Sierra Grande arch or uplift on the east; and (4) the Las Vegas basin in the south-central part of the area.

In order to determine the most favorable areas for petroleum accumulation within these provinces it is necessary to go back into the geological history of the area to see how and when the sediments in which petroleum is found were deposited and what happened to them to form reservoirs and traps for the possible accumulation of commercial quantities of petroleum. The present-day face of the area and its environment in the past were entirely different.

Reconstruction of the geological history of structure and sedimentation is necessary to evaluate general areas within Northeast New Mexico as to sedimentation and its relationship to reservoirs and possible source beds of petroleum. Marine conditions of sedimentation are considered necessary for source beds of petroleum, whereas the juxtaposition of marine and continental are considered necessary for commercial reservoir conditions.

1. Pennsylvanian time . . . The Pennsylvanian series of sedimentary rocks is probably the oldest geological period with which we will need be concerned. Sediments of Pennsylvanian age rest on pre-Cambrian or igneous rock which is called basement rock in some instances.

There were two major positive elements or land masses rising above the Pennsylvanian seas in northern New Mexico during Pennsylvanian time; the Sierra Grande uplift on the east side of the area shown in Fig. 1 and the Uncompahgre uplift occupying the north-central part of the state.

There were two large negative areas or geosynclinal areas or basins: the San Juan basin in the northwestern portion of the state, and the Raton-Rowe-Mora-Las Vegas basin in the northeast-central portion of the state. The Raton-Rowe-Mora-Las Vegas basin is considered to have been one large basin very similar to the San Juan basin in type, size, and extent.

During early Pennsylvanian time, the epeiric seas were widespread and marine conditions existed in the two major basin areas. The Sierra Grande arch and Uncompahgre uplift were land areas furnishing clastics or river gravels, washes, etc., into the sea of the Raton-Rowe-Mora-Las Vegas basin. Limestone was being deposited in the truly marine areas of the basin. This is

exemplified by the Sandia and Madera. (See Fig. 2.)

During late - middle Pennsylvanian time, linear, positive masses in the center of the Raton-Las Vegas basin expressed themselves in land mass mountains represented by the Truchas Ridge of the Sangre de Cristo Mountains. The sea was still widespread but now divided with the central land mass furnishing clastics to the sea. This is exemplified by the Madera member.

The final close of Pennsylvanian time showed sedimentation gradually exceeding subsidence. The adjacent land masses were furnishing depositional material to the extent that it leveled off the basin until coarse fluviatile and deltaic-type deposition was the only sedimentation. The true marine conditions were almost eliminated. This was exemplified by the Sangre de Cristo formation.

2. Permian time . . . Following the final stage of fluviatile and deltaic deposition, the sea encroached again from the south and southeast by a general subsidence of the basin areas, and the littoral and neritic deposits of the Permian were laid down covering the older Pennsylvanian basin, the median linear land mass ridges, and the major marginal land mass of the Uncompahgre and Sierra Grande uplifts. The Yeso and San Andres formations are examples. (See Fig. 2.)

3. Triassic time . . . Triassic time was marked by a blanketing of the area by flood plain deposits following an extensive sandstone transition phase, which marked a fluctuating sea. A few

SYSTEM	SERIES	STAGE		SUB-STAGE
QUARTERNARY		ALLUVIUM, SEDIMENT, DOLSON		
TERTIARY	PLIOCENE	OGALLALA		
	PALEOCENE	RATON		PATOTOE CREEK TIN PAN COAL YANKEE COAL SUBARITE COAL RATON COAL
CRETACEOUS	MONTANA	VERMEJO		RAIL CANYON
		TRINIDAD		
		PIERRE		
	COLORADO	NIOBRARA		APISHAPA TIMPAS
		BENTON		CARLISLE GREENHORN GRANEROS
		DAKOTA		DAKOTA PURGATOIRE
JURASSIC		MORRISON TODILTO WINGATE		
TRIASSIC	UPPER	DOCKUM		CHINLE SANTA ROSA
PERMIAN	GUADALUPE	SAN ANDRES		UPPER CLASTIC LOWER LS.
		GLORIETA		
	LEONARD	YESO		
PENNSYLVANIAN	VIRGIL	MADDALENA		SANGRE DE CRISTO
	MISSOURI			MADERA ARROSE LS. MEMBER
	DES MOINES DERRY			MADERA GRAY LS. MEMBER SANDIA
PRE CAMBRIAN	PRE-CAMBRIAN	GRANITE, GNEISS, SCHIST		

Fig. 2—Geologic section of Northeast New Mexico.

The Rocks of the Area . . .

The strata of Northeast New Mexico range in age from pre-Cambrian to Quaternary but Cambrian, Ordovician, Silurian, Devonian, and probably Mississippian beds are missing. (See Fig. 2.)

Following is a classification of the petroleum possibilities of the rock section of Northeast New Mexico based on reservoir characteristics and environmental conditions affecting possible petroleum sources.

Pre-Cambrian (negative) . . . Very little, if any, reservoir and no known petroleum source.

Pennsylvanian (good) . . . Consistently petroliferous; however, some of the upper sandstones are tight and nonmarine. Localized folding is generally absent. Lower Pennsylvanian is marine, widespread, with good reservoirs and probably good source material.

Permian (fair to poor) . . . Yeso has shows of petroleum but is generally fine grained and tight. Where the Yeso rests on pre-Cambrian, however, there exists porosity and oil shows.

Glorieta sandstone is thick and has good porosity but few shows.

San Andres has thin, dense limestone and red bed silt but has had several oil shows in the area in lenticular type sand lenses.

Triassic (fair to good) . . . Santa Rosa sandstone is exposed in most places in the southern part of the area; however, it is a tar sand in the vicinity of Santa Rosa, N. M., and deeply buried in the Raton basin carrying shows of oil and gas.

Chinle is composed of red beds with some tight sand lenses in the southern part of the area, but carries shows in the northern part.

Jurassic (fair to good) . . . Wingate sandstone is an excellent fluid carrier but is exposed over most of the area in the southern part of the area. To the north, it carries shows where buried.

Morrison lenticular sands are very poor possibilities.

Cretaceous (good) . . . Dakota sandstone has excellent porosity but limited permeability. There is evidence of petroleum. Trap has to be strong structurally.

Pierre Shale (Mesaverde) has sand lenses which have oil and gas shows and porosity.

Trinidad sandstone is absent or exposed.

Vermejo is absent or exposed with no localized folds and very little porosity.

Tertiary (poor) . . . Raton and Ogallala formations are the same as the Trinidad and Vermejo formations. There is no localized folding occurring at the proper time. The beds are confined to the north. They are extremely lenticular and are exposed over most of the area. Source beds are not known.

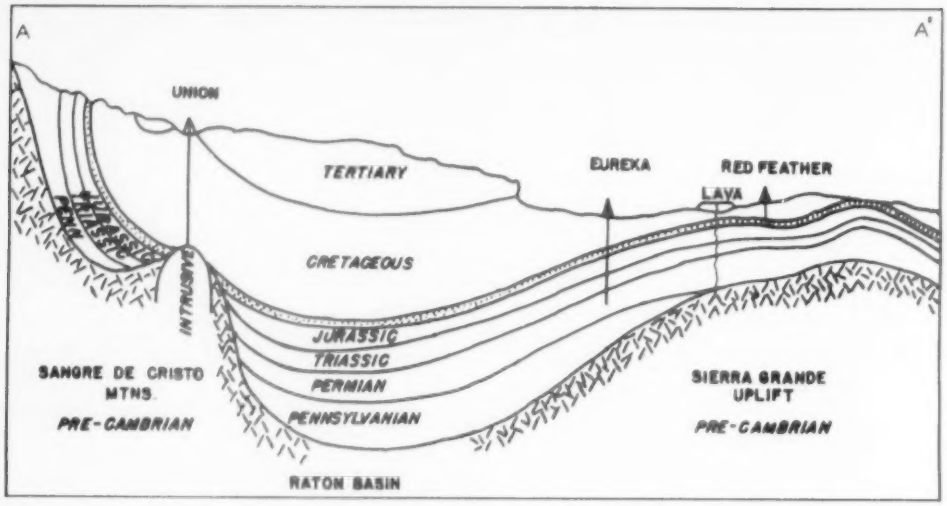


Fig. 3—Cross-section of the Raton basin. Note diagrammatic sketch of west flank structure formed by igneous rocks injected after deposition of sedimentaries. (See Fig. 1 for line of section.)

remnants of land masses, which remained from the Pennsylvanian orogeny, were finally reduced and buried during Triassic time. Examples are the Santa Rosa sandstone and the Chinle formation.

4. Jurassic time . . . Gradual and irregular subsidence of the land followed Triassic and marked Jurassic time with slow continental or lacustrine sedimentation exemplified by the Wingate sandstone and the Morrison formation.

5. Cretaceous time . . . Cretaceous time is marked again by widespread transgression of the sea from the south and southeast, causing widespread deposition of Dakota sandstone, a transitional marker covering all land masses during the period. Following the Dakota, a period of marine shale deposition, thick and widespread occurred, exemplified by the Benton, Niobrara, Pierre shale or Mesaverde, and Vermejo.

During late Cretaceous, land movements occurred forming the major portion of the Sangre de Cristo Mountains with high-angle thrust faulting on the

IMPORTANT TESTS DRILLED IN NORTHEASTERN NEW MEXICO

Test, location, reported shows and formation—	Type show	Total depth and formation
Skelly 1 Tercio, Colorado:		
Jurassic (1,760-1,860 ft.)	Strong odor	7,457 ft. Penn. into pre-Cambrian
Union 1 Bartlett, Twp. 31n-18e:		
Pierre shale (0-170 ft.)	Gas	4,411 ft. Cret. into igneous
Stanolind 1 CF&I, Colorado		6,997 ft. Penn. into granite
Eureka Oil Co. 1 Moore, Twp. 29n-24e:		
Pierre shale (0-790 ft.)	Gas	
Timpas limestone (790-1,000 ft.)	Gas	
Dakota (1,378-1,625 ft.)	Gas	
Morrison (1,625-2,095 ft.)	Oil	
Wingate (2,095-2,300 ft.)	Oil	
Chinle (2,300-3,023 ft.)	Oil and gas	
Santa Rosa ss. (3,022-3,172 ft.)	Oil plus 2,000,000 cu. ft. gas per day	4,083 ft. Glorieta (Permian)
New Mex 1 Shellaberger, Twp. 18n-18e:		
San Andres (1,200-1,560 ft.)	Oil	
Glorieta (1,560-1,625 ft.)	Oil	1,625 ft. Glorieta
Starr Oil 3 Adams, Twp. 17n-16e:		
Yeso (2,577-3,120 ft.)	Oil and gas	
Sangre de Cristo (3,120-3,831 ft.)	Oil and gas	
Madera (3,831 ft.)	25,000 cu. ft. gas per day	5,090 ft. Penn. into granite wash
Pioneer Oil 1 Farmer, Twp. 15n-16e:		
Chinle (538-1,309 ft.)	Oil	
San Andres (1,426-1,704 ft.)	Oil	
Glorieta	Oil and gas	2,215 ft.
Phillips 1 Leatherwood, Twp. 15n-18e		2,773 ft. Thin Penn. into hard igneous rock
S. W. Drilling Co. 1 Conchos, Twp. 17n-21e:		
San Andres (1,517-65 ft.)	Dead oil	3,512 ft. Thin Penn. into pre-Cambrian schist
American Mfg. 1 W. S. Ranch, Twp. 26n-20e		3,814 ft. Permian into granite
California Co. 1 Floreshein, Twp. 23n-24e:		
Granite wash (1,979-2,556 ft.)	300,000 cu. ft. CO_2 gas per day	2,556 ft. Permian into granite
Arkansas Fuel 1 Kruse, Twp. 19n-21e:		
Chinle (1,190-95 ft.)	500 cu. ft. noninflammable gas	
Santa Rosa (1,380-1,460 ft.)	12,000 cu. ft. noninflammable gas	
San Andres (1,620-75 ft.)	2,000 cu. ft. gas (CO_2)	2,613 ft. Permian into granite wash and granite
Granite wash (2,220-25 ft.)	10,000 cu. ft. noninflammable gas	
Waggoner 1 Upton, Twp. 18n-26e:		
Yeso (1,937 ft.)	Gas	
Granite wash (1,995-2,002 ft.)	Gas	2,171 ft. Permian into granite wash

THE AUTHOR

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east margin of the range lying in the southern part of the area. There has been a marked lack of deformation of the area east of the mountain front.

6. Tertiary and Quaternary time . . . Early Tertiary time found the Sangre de Cristo Mountain uplift started and marked continual movement in the area of the Sangre de Cristo anticlinorium and a lack of subsidence in the south developing a somewhat restricted basin (Raton coal basin) to the north. The basin obtained source material from the adjacent land masses and was the receptical for the deposition of the Raton formation (Paleocene) overlying undisturbed Cretaceous sediments.

Apparently little or no effect of the orogeny to the west was transmitted to the basin in the manner of folding or faulting during Cretaceous and Tertiary time. There is evidence of middle and late Tertiary orogeny in the Sangre de Cristo area which probably resulted in the present-day Sangre de Cristo range, but still did not affect the Raton basin area.

Late Tertiary and early Quaternary time marked the intrusion of laccoliths and stocks, plugs or volcanic vents, volcanoes, and finally lava flows covered much of the northeastern area and central western area.

Evaluation by Areas

The northeastern corner of New Mexico has been divided into four general areas for the purpose of grading as to the percentage of petroleum possibilities based upon the rock section (reservoir and source) and the structural aspects (traps for accumulation). (See Fig. 1.)

Area 1 Raton basin (good) . . . Area 1 encompasses mainly the Raton basin, bounded on the west by the Sangre de Cristo Mountain range and on the east by the Sierra Grande uplift. Within the area, test wells have shown some oil and gas shows, but the area appears to be devoid of any appreciable folding, at least in the upper beds. Two large dome-like structures on the west flank of the basin, the Vermejo Park and Tercio, Colorado, structures have been tested on the crests with negative results. The west flank structures were apparently formed by intrusive igneous rock masses recently injected into the strata perhaps some time after the possible formation of petroleum and migration thereof. (See Fig. 3.)

If the age of the intrusions is not too young, then flank testing the structures might be a good investment, although the age is in question. A more favorable location for testing is probably the east flank of the basin where pinchout of the Pennsylvanian occurs against the old land mass of the Sierra Grande uplift and where there is strong evidence of sand lenses in the Mesaverde or Pierre shale section with shows of oil and gas similar to the sand pinchout producing zones of the Mesaverde in the San Juan basin.

The Dakota sandstone in the southern part of Area 1 is an excellent aquifer but with extremely variable permeability where it was studied in the southern part of the Raton basin. Water wells in the Dakota are very erratic; one good water well adjacent to a very poor one, and so on. It may be the Dakota is more consistent to the north where more deeply buried and if so, would provide an excellent reservoir provided there is sufficient structure to trap commercial accumulations of petroleum.

Area 2 Sierra Grande uplift (fair to poor) . . . Area 2 embraces the Sierra Grande uplift area and its southward extension into San Miguel County. The Sierra Grande uplift was an old positive area in existence during Pennsylvanian time and consequently, most of the tests drilled along the flank and on the uplift proper have gone out of Permian directly into thin Pennsylvanian clastics and/or into granite or basement. The Pierre shale sand lenses are mostly exposed as in the Dakota and most of the Cretaceous in the area. The object beds for petroleum accumulation would be the Dakota where buried, and the Permian formations, where they are not of a trashy nature, along the uplift which is not conducive to commercial accumulations of petroleum.

Area 3 zone of volcanism and disturbance (fair to poor) . . . Area 3 lies between Area 1 and Area 4, embracing the easternmost extending pre-Cambrian porphyritic mass of the Sangre de Cristo Mountains. It is a zone of extensive volcanism with accompanying lava flows and associated faulting, fracturing, and folding.

The area probably marks a connection between the young Sangre de Cristo Mountain uplift on the west and the old land of the Sierra Grande uplift on the east. The section is believed to be chopped up and erratic and very complicated for exploration. The area is indicative of an old existing zone of weakness in the basement strata, probably associated with the early Pennsylvanian linear movements and subjected to rejuvenation during the comparatively recent Sangre de Cristo orogeny.

Area 4 Las Vegas basin (good) . . . Area 4 embraces the now long, narrow Las Vegas basin area bounded on the west by the Sangre de Cristo Mountain front, on the north by the zone of volcanism and disturbance, and on the east by a Sierra Grande uplift extension area. A test just north of town of Las Vegas, N. M., reveals 5,000 ft. of sediments with some 2,000 ft. of Pennsylvanian section overlain by hiatuses and unconformitives. It also indicates folding and movement which may have formed traps. The reported shows in the test, plus the presence of asphaltic residues in the Pennsylvanian section in the mountains to the west, are encouraging. The fact that the test, drilled in 1929, was poorly located is also encouraging, as is the fact that the Pennsylvanian section is composed of somewhat clean limestone, sandstone, and arkoses in contrast to a depositional conglomerate.

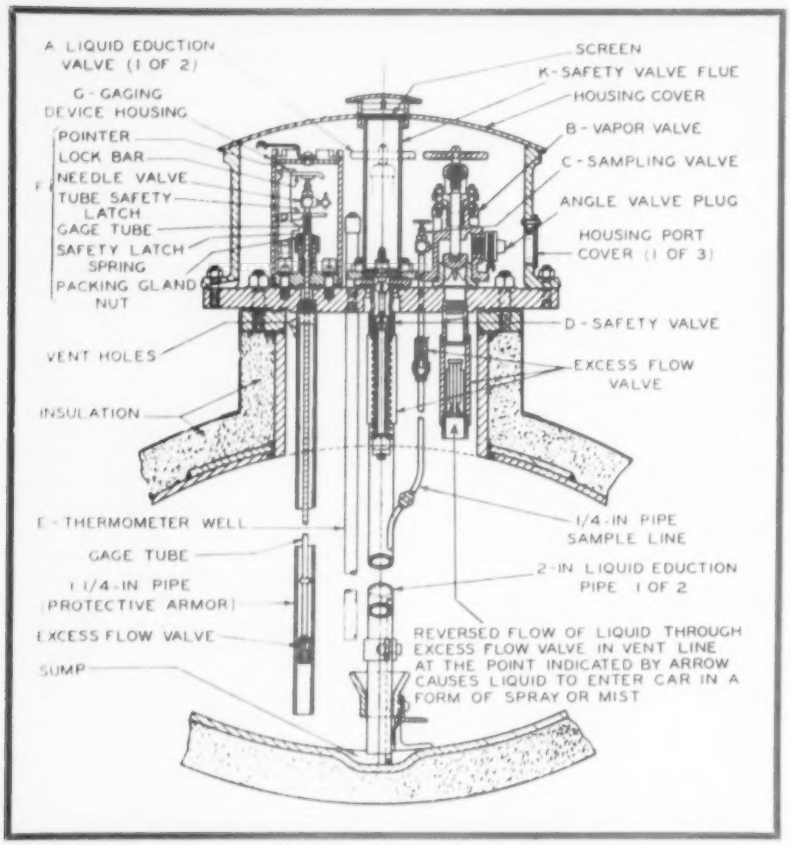
Conclusions

The broad and regional classifications are not intended to condemn one area or laud another, but to show relative valuation based upon sedimentation and structure.

The simularity of the San Juan basin and the original Raton-Rowe-Mora-Las Vegas basin is very significant. It is believed that the Mesaverde (Pierre shale) lenticular sands have a possibility of proving productive in northeastern New Mexico, as they have in the San Juan basin. Their characteristics are very similar. The Dakota sandstone, where found deeply buried and in a structural position, should be as productive as it is in other areas. In the northern part of the area, the Raton basin, the production possibilities of the Wingate or Entrada sandstone, which now produces oil in the San Juan basin, should not be overlooked. The Santa Rosa sandstone also has possibilities in the Raton basin and, of course, the potentialities of the Pennsylvanian rocks should not be discounted with so much evidence of petroleum found in the beds of the areas.

Further exploration for the proper objectives in the areas of the most favorable possibilities for commercial accumulation of petroleum in northeastern New Mexico is required to open a new Rocky Mountain exploration frontier.

"Further exploration . . . in northeastern New Mexico is required to open a new Rocky Mountain exploration frontier."


A LIQUID EDUCTION VALVE (1 OF 2)
G - GAGING DEVICE HOUSING
POINTER
LOCK BAR
NEEDLE VALVE
TUBE SAFETY LATCH
GAGE TUBE
SAFETY LATCH SPRING
PACKING GLAND NUT
VENT HOLES
INSULATION
E - THERMOMETER WELL
GAGE TUBE
1 1/4-IN PIPE (PROTECTIVE ARMOR)
EXCESS FLOW VALVE
SUMP
SCREEN
K - SAFETY VALVE FLUE
HOUSING COVER
B - VAPOR VALVE
C - SAMPLING VALVE
ANGLE VALVE PLUG
HOUSING PORT COVER (1 OF 3)
D - SAFETY VALVE
EXCESS FLOW VALVE
1/4-IN PIPE SAMPLE LINE
2-IN LIQUID EDUCTION PIPE 1 OF 2
REVERSED FLOW OF LIQUID THROUGH EXCESS FLOW VALVE IN VENT LINE AT THE POINT INDICATED BY ARROW CAUSES LIQUID TO ENTER CAR IN A FORM OF SPRAY OR MIST

TOP LOADING of tank cars through the vent or vapor outlet valve as shown has definitely cut loading losses in the experience of Magnolia Petroleum Co.

Eliminate Loading Loss by

Spray Loading of Tank Cars

Vapor venting is eliminated, loading time and equipment are reduced by top-loading method

by W. J. Rodgers

WHATEVER the explanation as to spray-loading behavior mechanism, the fact remains that spray loading is operating successfully, and does definitely cut loading losses. In some of Magnolia Petroleum Co.'s operations that formerly had losses as high as 5 per cent, loading loss has been virtually eliminated by this method.

Spray loading is the name that has been given the procedure of loading tank cars through the vent or vapor cutlet valve. A more appropriate name could probably not be found because it is believed passage of liquid through the excess flow valve in the vapor line causes the liquid to enter the tank car in a spray.

Author superintendent of personnel and safety, natural-gas department, Magnolia Petroleum Co. Paper given at regional meeting N.G.A.A., Tyler, Tex., October 23, 1953.

Advantages of spray loading are:

1. Elimination of the venting of vapor—this means additional gallonage in company tanks, which represents money to company operations.

2. Reduction in loading time—accomplished by less physical effort on the part of the loader, inasmuch as fewer connections are required; therefore, loading can be started in a minimum length of time.

3. Reduction in the amount of equipment—one fewer hose and fittings is needed. This item within itself represents considerable saving.

So far Magnolia has not loaded any tank trucks by this method. However, it is believed this method has the same possibilities, with the same results. The big problem is to convince the transporter of the saving in loading time, and the saving in products to him, where he is loading from his own storage.

As a matter of interest, the approximate cost of converting a transport truck tank to top loading is $200. This cost includes the following:

Two valves	$ 60.00
Two excess flow valves	19.00
Tank steaming	30.00
Welding	20.00
Miscellaneous fittings	20.00
Shop labor	20.00
Cage and cover to guard valves	30.00

This information was obtained from a reliable tank company which reported that it had recently made this conversion.

Conventional Loading

What happens inside the tank car as it is being loaded by the old conventional method? The liquid enters the car through the eduction valve and eduction pipe that extends to the bottom of the car. Vapors from the previous loading exist in the car at a pressure ranging from 0 psig. upward, depending on several factors, such as type of previous product loaded, temperature of vapors, and method used in unloading previous load. This vapor blanket is compressed by the rising liquid and has little chance of being absorbed, as the only contact made is at the relatively flat surface of the rising liquid. For this reason, the rising layer of liquid compresses the vapor faster than it can be absorbed, and the relief valve is popped if the tank is not vented.

Venting . . . Normally, to prevent popping of relief valves, excess vapors are vented through a vapor line controlled by a back-pressure regulator or a common valve, hand controlled. Vapors passing through one of these installations represent loading loss unless they are reclaimed by some method. This loss is negligible if the vapors are returned to storage or plant process.

However, returning vapors to storage or to plant process requires additional expense for equipment, and can also be an extra load on existing equipment. In many cases, loading racks are so removed from the plant that it is not

Watch tank-car pressure to prevent popping of safety valves

feasible to install vapor lines to reclaim this loss.

Spray Loading

Now, in the spray or vent-line method of loading the liquid enters the car through the vapor line which terminates at the top of the shell. Inside this line there is an excess flow valve installed for the same purpose as other excess flow valves, but in this instance, it is believed this serves an entirely different purpose. It is believed that a spray action of the liquid is created as it passes backward through the valve. If the assumption is correct, the spray is refrigerated by the pressure drop at the valve to an extent depending on the tank-car pressure.

Vapor absorption . . . Normally, a pressure-type tank car has only one vent valve, so it is apparent, since the pop valve does not operate during loading, that the vapor content of the car must be absorbed and condensed into liquid, except that portion left as outage. The spray gives more intimate contact with the vapors so that absorption should be easier, and therefore, greater than with the old method, where the liquid is a rising layer from the bottom of the car.

Heat transfer . . . What happens to the heat of condensation of the vapors? The heat effect is the same for either loading method, provided the same amount of vapors are condensed. However, the transfer of the heat to the spray is much more efficient than to the surface of the liquid layer, as in the old loading method. Using the old method, the heat would be more concentrated in the surface of the liquid, causing an increased pressure effect.

Calculations show that when the entire tank-car contents absorb the heat of condensation, the resultant rises in temperature and pressure are of magnitudes that might not be noticed and would not exceed relief-valve set pressure except on unusually hot days.

For example, if an empty tank car contains vapors at 20 psig., the heat of condensation alone would be sufficient only to raise the entire filled car about 2° F. in temperature, and 4 psi. in pressure, even if the loading temperature was 100° F.

Actual test . . . A car loaded with 190 psi., R.v.p. propane, with the temperature of the propane loaded at 80° F., atmospheric temperature 82° F., temperature of vapors in the car 78° F., and 10 psig. on the tank car, the final loading temperature was 80° F. at 160 psig. Actually, the temperature immediately after the loading started was reduced to 44° F., in the thermometer well, but since the well is directly under the spray, it is thought that this could not be a representative temperature. However, it is believed this does prove that there is beneficial cooling due to expansion.

Watch relief valve . . . The only additional safety precaution to be taken in spray loading is the necessity of watching tank-car pressure to prevent popping of relief valves. If popping pressure is approached, it might be necessary to close the loading valve on the manifold, open the bypass valve to vent line, and slowly reduce pressure on car to a safe point.

Good Loading-Rack Practices

The large quantity of products handled by tank car and transport truck in our industry make good loading practices of extreme importance. The hazards involved are numerous, with respect to both personnel and equipment. However, such hazards can be minimized, or eliminated, if all persons involved will exercise due care and consideration.

The natural-gas department of Magnolia Petroleum Co. has never had a serious accident to any of its loading-rack personnel. It is believed this is due to the fact that Magnolia supervisors are constantly on the alert and are continually training employes in the correct procedure for doing a job.

Put the Product in the Right Tank!

In loading operations it is most important that loading-rack personnel familiarize themselves, not only with existing safety practices, applicable laws, and regulations, but with the various types of tank cars and transport trucks. This is extremely important in order that no slip-up may occur, whereby products are loaded into tanks that were designed for a different pressure product.

Low-pressure cars . . . To avoid accidents of this nature which have happened, and in some cases have been disastrous to both personnel and equipment, the following should be known by all loading-rack personnel. Natural gasoline and heavier products are loaded into tank cars, referred to as low-pressure-type cars. All low-pressure cars have bottom outlet for unloading, removable dome covers, and two safety valves. If loading-rack personnel keeps this in mind there should never be a slip-up, such as loading a high-vapor-pressure product into this type of car.

Low-pressure cars are constructed in conformity with requirements of A.R.A. specifications and ICC or A.R.A. regulations, and water capacity of tanks in pounds, is stenciled on the jacket of each car. Although, the specifications under which cars were originally constructed made all cars of this type uniform, a large number of these cars have been refitted so that it is impossible to specifically state the exact equipment which will be found on any one car.

High-pressure cars . . . These L.P.G. tank cars are easily distinguished, as they are constructed with a manway nozzle in top of the tank shell. The opening into the tank is closed with a heavy manhole cover bolted to the car. This manhole cover should never be opened by loading-rack personnel. All valves and fittings used in loading operations are mounted on the manhole cover and are protected by a housing with a hinged lid. There are no bottom outlets on high-pressure tank cars. All gaging, loading, and unloading operations are made through the manhole cover on top of the car.

The truck driver . . . In truck loading the transport truck driver is an outside man who has a very important part in truck-loading operations. Especially is this true in small plants, where company personnel, such as operators, or the man in charge, have responsibilities in areas other than the loading rack—thus the transport driver assumes considerable responsibility for loading operations. When outside personnel frequent the loading rack, they are subject to the same safety rules, regulations, and practices as are required of company personnel.

Tank Car Loading Racks

Loading racks for tank cars vary in size and equipment, depending on quantity and type of products to be loaded, and location of rack with regard to plant and storage facilities. Magnolia has standardized on prefabricated, all-metal racks, which are located with due consideration being given to prevailing winds and elevations. All lines are manifolded to a common hose header, so that one loading hose services all risers. Hose headers are connected to vent lines, to allow venting of hose after loading—i.e., before hose is disconnected from tank car. This vent line riser is strategically located to prevent danger of fires from passing trains and automobiles.

Piping . . . At all of Magnolia's loading racks piping is of welded construction, with all fittings and pipe of proper rating, to withstand the service.

Loading safety a matter of proper instruction plus judgment

Forged-steel valves with full round opening, and friction-free seating, are used on all of the newer racks. In connecting hose to headers, swivel joints and bolted hose clamps with extended fingers are used to engage collar on stem of spud. This minimizes danger of hose failure. Only hose that meets all requirements set out by governing bodies is used.

In addition to required excess flow valves, Magnolia installs an excess flow valve in each L.P.G. line ahead of the manifold.

To connect hoses to tank cars, Magnolia standardized on high-pressure wing unions with metal seats.

Bonding . . . All of Magnolia's racks are bonded through cables connecting the railroad track to the rack. This is a permanent installation, provided for during construction. By this arrangement, tank cars are automatically grounded as cars are spotted. "Danger" and "No Smoking" signs are used to warn company employes and outsiders. Only approved nonsparking tools are used. For night loading, all racks are equipped with explosionproof fixtures.

Fire protection . . . This is provided by installing dry-chemical extinguishers at 100-ft. intervals on top of the rack, and one at the bottom of each stairway on large racks. Where water is available, fire hydrants and hose equipped with combination straight stream and fog nozzle are provided. Where water is not available for fire protection, a large dry-chemical extinguisher is installed at a strategic point at all of our larger racks. All of this equipment is checked at regular intervals to be sure it is ready for use in emergencies. Periodically, fire-fighting equipment is moved to a training ground where all employes are familiarized with how it operates, and the correct type of extinguisher to use on the various types of fires.

Truck Loading Racks

The same equipment in respect to fittings, piping, hose, and tools is used at all truck-loading racks. The truck-loading racks are usually at ground level, and for this reason, a very substantial guard rail is provided to prevent bumping and breaking of fittings and lines.

The racks are usually located at or near plants; therefore, equalizing lines to storage are provided to reclaim vapors. After loading, the hoses are vented to compressor suction, thus eliminating the need for a vent line riser.

Fire protection is provided by dry-chemical extinguisher, fire hydrants, and hoses with combination straight stream and fog nozzles. At all transport loading racks, rubber-covered bonding cables are provided to ground truck to racks.

Before loading . . . Proper instruction, and the use of common sense, are the keys to accident prevention in loading operations. At tank-car racks, someone is required to be in attendance at all times during loading. Before loading, cars are checked for pressure rating, damage, and leaks. Brakes are checked, and "Caution, Tank Car Connected" signs are placed on siding to prevent train crew entering and bumping cars. "No Smoking or Open Lights" rules must be observed, and only explosionproof lights or lanterns are used.

Loading hose is inspected before each loading, and if any defects are found, they are not to be used. To avoid hose damage, loading rack personnel are cautioned not to bend hose more than necessary, at any time. More specifically is this true when the hose may be frozen from venting after loading is completed. Loading-rack personnel are cautioned not to replace L.P.G. hose with gasoline hose, at racks where both products are loaded.

Employes are also cautioned and instructed to use extreme care before removing plugs from valves, and housing from slip-tube gaging devices, as pressure may be trapped underneath. Also, lock-on slip tube must not be removed while employe is standing directly above tube. Excess flow valves are never bypassed except to equalize pressure after shutoff. Hoses are always vented, and disconnected as soon as loading is completed.

After loading . . . When loading is completed, car is thoroughly checked for leaks, valves and gaging devices checked, hatch cover closed, pin replaced, and car sealed with metal seal. "Dangerous" placards are affixed to both sides and both ends of car. Before leaving rack, loading-rack personnel are instructed to check to be sure hoses and ramp are clear for the car to be moved by train crew.

At all transport-loading racks, it is company practice to inform outside personnel of safety regulations that must be observed. Before loading is started, loading-rack personnel are required to check permit, pressure rating, general condition of truck, and make sure no loading is done while motor of truck is running, repairs are being made to truck, or truck lights, radio, or other appliances are in operation. Truck wheels must be blocked to prevent rolling, and bonding cable clamped to paint-free surface of truck. Final checking and clearance are given by loading-rack personnel before driver is allowed to start motor of truck.

Standing instructions . . . These instructions to transport-truck-loading personnel are as follows:

1. Check transport truck for permits and licenses, required by regulatory bodies, and make casual inspection of equipment and its accessories, to ascertain if equipment meets applicable regulations. Transport trucks that are not in compliance with applicable regulations must not be loaded.

2. Before pumping operations are started, make certain the transport driver has taken the following precautions:

(a) Leveled and properly blocked equipment.

(b) Switched off motor and lights.

(c) Connected loading and vapor hose.

(d) Connected static bonding cable to bright metal on transport truck.

(e) Opened loading valves on loading manifold and vapor line.

3. Static bonding cable must not be disconnected for any reason during the loading or unloading operations.

4. Hand tools used in connection with loading and unloading operations must be of nonsparking metal.

5. Use only explosionproof flashlights or lanterns approved by safety department during loading or unloading operations.

6. Transport tanks not completely empty must be gaged before loading and/or filling is started.

7. Someone familiar with transport-loading operations must remain at the truck at all times to avoid spills and prevent fire hazards.

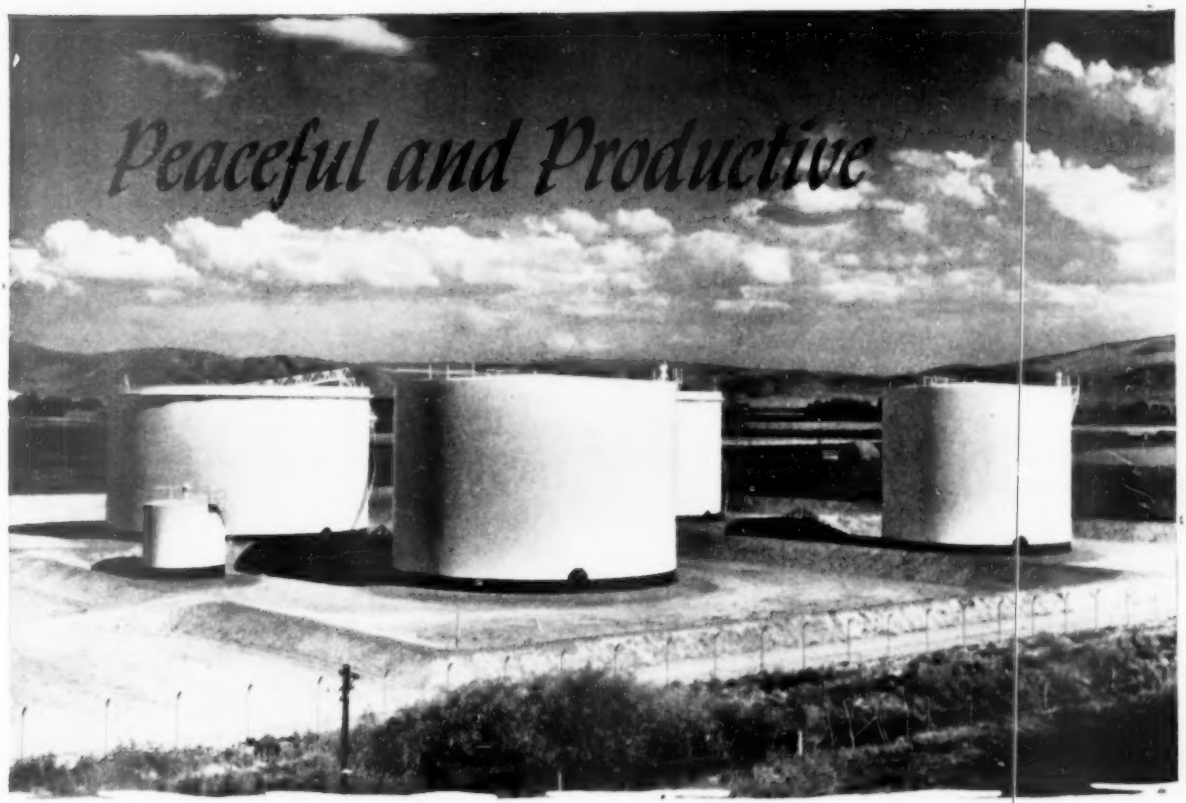
8. Should a leak be discovered during the loading or unloading operations, pumping equipment must be shut down and valves on pump and transport tank closed.

9. Gasoline-soaked clothing must be changed immediately to prevent skin burns, as well as fire hazards. Gasoline-soaked clothing must always be kept away from open fires.

10. Loading hose must be thoroughly drained into vapor return line before it is disconnected from the loading manifold of the transport tank.

11. Witness final liquid-vapor gaging and record temperature, after loading is completed.

12. Prepare forms necessary, following specific instructions that are applicable to state in which loading is done.



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Oxidized Petroleum Wax Forms Superior Grease Base

. . . Sodium-base grease gives excellent results in high-temperature service

by J. C. Kirk and E. W. Nelson

PETROLEUM wax can be oxidized to form a saponifiable base which may be used for the production of lubricating greases with outstanding properties.

The oxidation process utilizes atmospheric air with zinc stearate and colloidal manganese dioxide as catalyst. The air is introduced continuously into a stirred reactor maintained at approximately 275° F. The oxidation period requires about 4.5 hours.

Best results are obtained when the oxidized wax is mixed with normal fats and fatty acids, prior to the final grease preparation steps. Sodium and lithium-base greases prepared from this mixture offer most promise.

The sodium-base grease gives excellent results in high-temperature service. A lithium-base grease, made from a mixture containing 75 per cent oxidized wax and 25 per cent hydrogenated tallow fatty acid, is an excellent multipurpose lubricant.

Grease Preparation

Batches of grease were prepared using oxidized wax of widely varying characteristics. In order to determine suitability and superiority, batches were first prepared in which the nature of the oxidized wax was the only variable. In this manner, it was possible to determine the most suitable wax base for oxidation and the most satisfactory oxidation process. In general, usual procedures were used in which the saponifiable base was combined with the proper amount of the desired saponifying agent and the resultant soap base processed so as to produce a grease.

The equipment used was the conventional laboratory and pilot-plant experimental kettles of both open and closed types. For preliminary studies, batches of 6 and 12-lb. sizes were usually prepared. These were followed by 200-lb. batches where results justified further investigation.

Authors are associated with Continental Oil Co. Paper presented at annual meeting, National Lubricating Grease Institute, Chicago.

In view of the varying characteristics of the oxidized wax bases which were used, processing conditions such as maximum temperature, time, etc., were necessarily varied accordingly. Since a general evaluation of the various oxidized bases was required, greases were prepared or their preparation attempted, with sodium, calcium, lithium, barium, aluminum, and mixed sodium-calcium base.

Sodium-base grease . . . The oxidized-wax base was most amenable to a soda-base grease. Regardless of level of oxidation, some form of grease would result, but with widely varying properties. Best results were secured with a base of intermediate level oxidation having an acid number of 70-90 and saponification number of 140-180. Using this base, a grease of these typical characteristics was prepared.

GREASE A

Mineral oil	500 at 100 S.s.U. - 50 v.i.
A.S.T.M. pen. 60 strokes	280 (10,000 strokes 340)
A.S.T.M. dropping point, °F.	465
Free alk. as NaOH	0.05 per cent
Soap (based on oxidized wax)	20-21 per cent
Water resistance (boiling H_2O)	Poor
Separation	2.0 per cent
Evaporation	0.5 per cent
Oxidation stability	Poor (without anti-oxidant)
Wheel-bearing test	Good
Corrosion Resistance	Good
Texture	Gel-like, nonfibrous
Color	Dark greenish-brown
Odor	Of oxidized hydrocarbon

This grease was selected for an extensive service test in general plant lubrication, particularly for those locations which were not susceptible to moisture and where operating temperatures were high. One such location is the motors used in solvent-treating operations which have been found to be particularly difficult to lubricate. Lubricants which had been previously used often resulted in lost bearings.

The experimental grease prepared with a 100 per cent oxidized-wax base has been used for this service for a period of approximately 3 years with completely satisfactory results and no lost bearings.

Sodium-base greases made with straight oxidized wax generally have little tendency toward fiber structure. However, at the intermediate level of oxidation, a slight fiber can be noticed. A characteristic gel-like texture, which is exceedingly thixotropic in character, develops in all cases. Normal fats and fatty acids can be admixed with the oxidized wax in any proportion and will alter the texture and other characteristics accordingly.

Calcium-base greases were found difficult to handle and impossible to prepare by the normal procedure for lime-base greases. Structure stability was exceedingly weak, and the grease retained its structure for only a short period of time after which it reverted to a thin soupy consistency.

Mixed-base sodium, calcium . . . A mixed sodium-calcium base grease in the generally used base ratio of 85/15 was found to have some interesting possibilities. Tendency toward fiber formation is somewhat increased over that of either sodium or calcium alone. This grease, likewise, forms a gel-like texture which is very thixotropic in nature. There is no apparent fiber in the usual sense.

The grease has a dropping point somewhat higher than that of normal mixed-base grease, but is exceedingly susceptible to water. Physical characteristics of the mixed-base grease were fairly comparable to those of sodium in respect to texture, yield, oxidation stability, melting point, and shear stability.

Barium base . . . No favorable results were obtained with barium greases with any of the oxidized bases, regardless of level of oxidation or type of mineral oil used. In all cases, a hard granular soap resulted which could not be dispersed.

Aluminum base . . . Aluminum-base soaps were prepared by double decomposition methods from many of the oxidized bases. In all cases, the soaps so prepared did not compare favorably with the normal fatty acid soaps in either solubility or gel characteristics.

It was apparent that this was due to the large quantity of mineral oil-insoluble soaps resulting from the highly oxidized portions.

By admixing the oxidized wax with normal fatty acids, soaps could be prepared which would approach the normal aluminum soaps in grease-forming characteristics. It was apparent that to obtain an aluminum soap of normal solubility and gel strength a more drastically refined and separated base would be required.

Lithium base . . . Lithium-base greases made with oxidized wax were found to be the most versatile. Either straight or combined with normal fats and fatty acids, they lend themselves to a variety of greases of widely varying properties. Since these greases were intended for multipurpose use, they were examined with those properties in mind. Straight oxidized-wax base produces a grease of poor water resistance.

By combining the oxidized wax with some of the normal fats and fatty acids, it is possible to produce a grease of greatly improved characteristics. As little as 25 per cent of a grease base such as hydrogenated tallow fatty acids gives a grease of satisfactory water resistance. As the degree of unsaturation of the admixed fatty materials increases, the water susceptibility increases.

Straight oxidized wax produces a gel-like texture somewhat similar to the sodium-base greases and with similar thixotropic properties. With admixed normal fats, the texture becomes more normal with less thixotropic tendency. Some fiber structure is evidenced in the straight oxidized wax base. The addition of as little as 10 per cent of normal fat shows a pronounced increase in fiber formation, and likewise results in an improved texture and better physical characteristics.

Two greases typical of these formulations show characteristics as follows:

	B	C
Mineral oil	1,200 at 100 S.s.U.-50 v.i.	1,200 at 100 S.s.U.-50 v.i.
Soap base	50% oxidized wax 50% hydrogenated tallow F.A.	75% oxidized wax 25% hydrogenated tallow F.A.
A.S.T.M. pen. worked	280	280
10,000 strokes	350	345
A.S.T.M. dropping point	376° F.	365° F.
Free alk. as LiOH	0.04%	0.05%
Soap (total base)	13.0%	16.0%
Separation	2.0%	2.5 %
Evaporation	None	None
Oxidation stability	Poor (without anti-oxidant)	Poor (without anti-oxidant)
Water resistance (boiling H_2O)	Good	Good
Corrosion resistance	Good	Good
Texture	Smooth gel	Smooth gel
Color	Dark greenish-brown	Dark greenish-brown
Odor	Oxidized hydrocarbon	Oxidized hydrocarbon
Wheel-bearing test	Very good	Very good

Both of these greases were used for general all-purpose lubrication in Continental's entire Ponca City fleet consisting of cars, trucks, tractors, and all motorized equipment for a period of 2 years with remarkably good results. The results were compared with those of the best greases previously used for similar operations. **A general resume indicated complete and adequate lubrication with a considerably reduced volume of grease.** During this test, more than 100 units traveled a distance of approximately 2½ million miles.

Grease Base

An oxidized wax base of 140-180 saponification number and 70-90 acid number was found most satisfactory for the preparation of greases. Sodium and lithium-base greases, which were comparable in many respects to those made with normal fats and fatty acids, were prepared.

Mineral oils of widely varying characteristics, both in viscosity and viscosity index, were used. As would be expected, the highly paraffinic oils were the most difficult to handle, and gave the least satisfactory results. The low or medium v.i. naphthenic oils gave the most satisfactory results.

Soap base . . . Oxidized wax may be used straight or in combination with normal fats and fatty acids. For some applications, a straight oxidized wax-base grease is completely satisfactory. In most cases, however, the admixture with normal fats and fatty acids improves the over-all characteristics.

Yields were generally low based on the total amount of soap-forming base. This was believed to be due to the lack of any definite soap structure. With the addition of normal fats and fatty acids, definite soap structure became apparent with improvement in both yields and over-all grease characteristics. In general, about 50 per cent more soap was required for consistencies comparable to those obtained with normal fats.

Texture . . . A gel-like texture appears to be common for the various greases made with straight oxidized wax, but in some cases it is extremely thixotropic. This texture can be altered to a considerable extent by admixture with normal fats and fatty acids, and by addition of various modifying agents.

Stability to working is fair. A typical sodium-base grease made with straight oxidized wax showed an increase in penetration from 300 to 350 upon working 100,000 strokes. The lithium grease exhibits the same order of stability.

Storage stability of oxidized-wax-base greases varies greatly. A sodium-base grease, such as that shown in Example A, has changed only slightly after 3 years' storage, except for the usual initial hardening. Other greases have shown considerable bleeding and hard gel formation on prolonged standing. This dissimilarity appears to result from variations in the composition of the oxidized base as well as from the type of soap used.

Oxidation stability . . . Without the use of inhibitors, the oxidation stability of greases made with oxidized wax is very poor as measured by the Norma-Hoffman method. Response to inhibitors is likewise poor and unpredictable. In spite of this condition, oxidized-wax-base greases have performed satisfactorily in some services without any apparent tendency toward oxidation or instability.

The dropping point of oxidized-wax-base grease is usually somewhat higher than that of comparable greases made with normal fats. This is particularly true of the sodium and sodium-calcium bases.

Oxidized-wax-base greases, when properly combined, show no tendency toward corrosion, either at room temperature or at 212° F.

Water resistance . . . All straight oxidized-wax-base greases exhibited considerable water susceptibility. With a lithium grease, the addition of 25 per cent of a normal fat having a low iodine value produced good water resistance.

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Production increased from 10 to 120 BOPD following acidizing workover

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As a result, production was increased from 10 BOPD to 120 BOPD.

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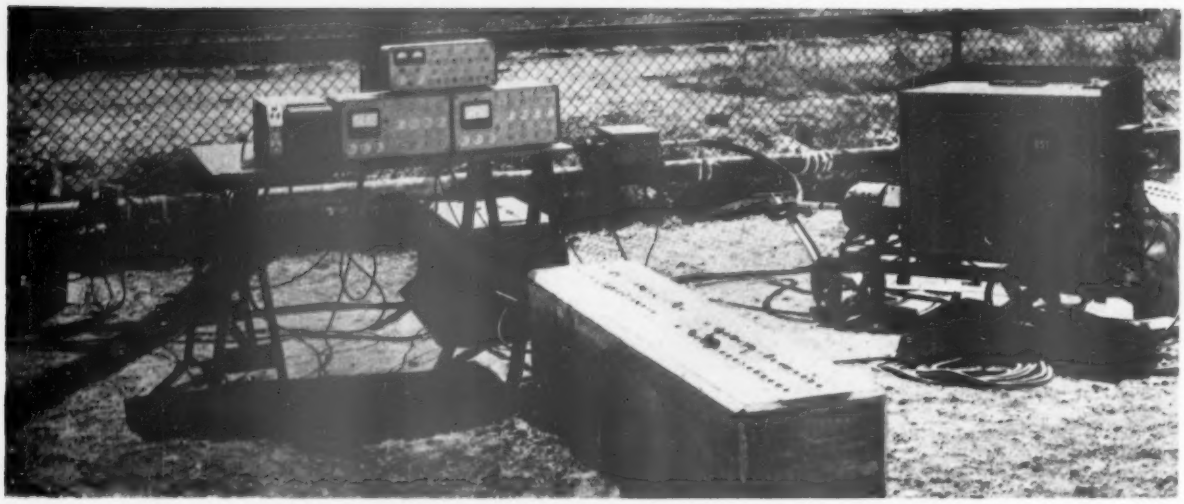

FULL-SCALE TESTING EQUIPMENT used to analyze the field characteristics of piping spans under varying conditions of span length, wall thickness, vibration accelerations, and displacements.

STOP COMPRESSOR-PLANT VIBRATION

Hazardous conditions develop in piping when unpredicted stresses are superimposed on the normal ones

by N. H. Moerke and C. Newman

EVERY effort should be made to minimize the cause of compressor-station vibrations at the source. Therefore, the plant must include adequate foundations under the engine and compressor to absorb the major vibrations. In addition provisions should be made to decrease gas pulsations as close to the source as possible. When these exciting forces have been minimized to the satisfaction of the designer, consideration should then be given to the vibration susceptibility of the piping system.

The major causes of vibration in compressor plant piping are:

1. The unbalanced forces that are set up by the reciprocating and rotating masses of the engine and compressor.
2. The gas-stream pulsations that are induced by the compressor pistons and valve action.

In reciprocating engine - compressor units that are commonly used in the natural - gas industry, some vibration will exist due to the inherent unbalanced forces in the engine. The forces that are totally unbalanced or only partly balanced are primarily due to higher order harmonics of rotating and reciprocating masses of the unit. The most serious harmonics depend upon the type, number of cylinders, arrangement of cylinders, and crank angles.[1]

Torsional vibrations are excited by nonuniformities in the driving torque due to the cylinder-gas pressure variations during the firing cycle. Of special significance in engine vibration are the major and minor critical speeds of the various orders that are a function of the firing impulses in the engine.[2]

These forces can result in vibrations that are transmitted to the compressor house floor, walls, structural members of the building, etc. Therefore, it directly follows that the vibrational forces may be transmitted to the piping. In many other fields the problem of vibration transmission from the rotating machinery to the piping is minimized or eliminated by the use of suitable flexible couplings or bellows.

In the natural-gas compression service, this is seldom possible because of the mechanical design and pressure levels at which the compressors operate. Therefore, it is common practice to couple the piping directly to the flanges on the compressor cylinders; this provides a system through which undesirable vibrations are readily transmitted.

Pulsations . . . Pulse pressure waves are set up in the gas stream by the reciprocating action of the pistons and the valve action. This results in rapid periodic fluctuations in the flow rate with corresponding periodic changes in pressure of the compressed fluid.[3 4 5 6] These alternating waves of compressions and rarefactions are known as pulse pressures and travel through the piping system at the velocity of sound in the gas.

In cases where the crank angles between compressor cylinders are equal and all of the cylinders are either single or double acting, the fundamental frequency or number of pressure surges per second can be computed for a reciprocating compressor as follows:

$$fp = \frac{SNA}{60}$$

where,

fp = pulse frequency in cps.
S = compressor speed in r.p.m.
N = number of compressor cylinders using a common manifold bottle
A = the action of the compressor: 1 for single and 2 for double-acting.

However, as a general solution, the relative crank angle between the com-

The authors are associated with Fluor Corp., Ltd., Los Angeles. Presented at the fall meeting, C.N.G.A.

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pressor cylinders that have a common manifold bottle must be taken into account. Based upon the engine crank angle and the location of the compressor cylinders, in cases where the impulses are uniformly spaced, their sum equals the number of cylinder ends and indicates the important harmonic.[5,7]

Gas pulsations have been analyzed by many investigators, and field measurements prove that this characteristic of reciprocating compressors results in a source of unbalanced force that can excite vibration-sensitive piping configurations. These gas-pressure waves can be transmitted through the piping system to excite vibration in piping or connected equipment at locations that are quite remote from the engine and compressor units. However, it is possible to minimize vibration at the source by isolating the compressor from the piping with carefully designed pulsation dampeners.

Distinguishing causes . . . It is usually difficult to distinguish between piping vibrations that are caused by gas-stream pulsations and mechanically excited vibrations. However, from field experience it has been found that a fairly accurate indication of the source of vibration, whether mechanical or pulsative, can be made in cases where the block valves in the laterals are near the compressors.

"Pinching" the block valves to take a pressure drop across the valves of about 10 per cent of the operating pressure will decrease vibrational displacement of the piping that is downstream of the valve on the discharge side or upstream on the suction side when the major exciting force is due to gas pulsations. However, if there is not a noticeable decrease in vibration, it may be assumed that the major exciting force is mechanical.

The valve-pinching operations must be performed on all units that are feeding into a common header system, because pulsation feedback and mechanical coupling with the other units may give erroneous indications.

Characteristics of Vibration in Piping

The variables that determine vibrational characteristics of a pipe span or configuration are:

1. Diameter of the pipe.
2. Wall thickness of the pipe.
3. Length of the pipe span.
4. Restraint of the piping by anchors, hangers, or guides.
5. Thermal and bending stresses in the pipe.
6. Elasticity of the supports.

Most of the above factors in piping design are set by economic, mechanical, process, and structural-design considerations. Therefore, it is logical for the designer to select variations in pipe-support spacing and piping configurations in order to adjust the vibrational characteristics of piping. This will have the least conflict with the over-all design of piping system.

Vibration in a length of pipe may be longitudinal, torsional, radial, or transverse. However, we will confine our analysis to transverse oscillation as this is normally the direction in which a span of pipe has the least stiffness, and, therefore, the greatest susceptibility to vibration. It is interesting to note that longitudinal forces can cause transverse vibration in systems when there is a nonsymmetrical disposition of mass or coefficient of stiffness about the longitudinal axis.[8] This condition will occur in a span of pipe where the sag results in nonsymmetrical distribution of mass with respect to the longitudinal axis of the pipe.

Synchronous vibration . . . Each span of piping has a fundamental frequency of vibration. This frequency is a function of the length of the span, diameter of the pipe, wall thickness, restraint by anchors and guides, and the elasticity of the supports and pipe anchors or guides.

If a span is set into oscillation by forces that are recurring at regular intervals, and these intervals are the same as the natural time period or a simple fraction of this time period, the amplitude of vibration of the body may increase even though the force applied is not large. Such conditions are called reasonance, and they may become structurally dangerous for the operation of the piping system. In actual installations, inherent damping in the piping system tends to limit the vibrational displacement that is reached in practice at reasonance.

Effects of Vibration

Markl[10] has conducted fatigue investigations on full-scale piping components to evaluate the safety of piping systems when subjected to cyclically varying bending moments due to vibrations, pressure pulsations, or thermal expansion and contractions.

Fig. 1 presents the results of some of Markl's interpretations in the form of a modified Goodman diagram. This compares the results of his work with the stress limitations that are set forth in the A.S.A. B 31.1 Code for Pressure Piping, using combined stresses composed of torsional, longitudinal (bending and pressure), and circumferential (pressure) stresses at the ordinate, with cycles to failure as the abscissa.

For oil piping within refinery limits, the maximum allowable stress range for A.S.T.M. Specification A106 Grade B Carbon steel is 24,000 psi. for only mild cyclic conditions, and one-half that value for vibratory conditions. These values appear on Fig. 1 as horizontal lines. The upper one intersects the lower limit of the test data at a point representing about 100,000 cycles, while the lower line is near the endurance limit (normally the endurance strength obtained for at least 2,000,000 and preferably 10,000,000 cycles).

Considering the many indeterminable factors in piping design, Markl states that a safety factor of at least two should be used. On this basis the "normal" allowable stress range specified by the code should not be applied where more than 3,000 cycles of major stress change are anticipated, perhaps three cycles per week for a 20-year life. This shows the hazardous conditions that

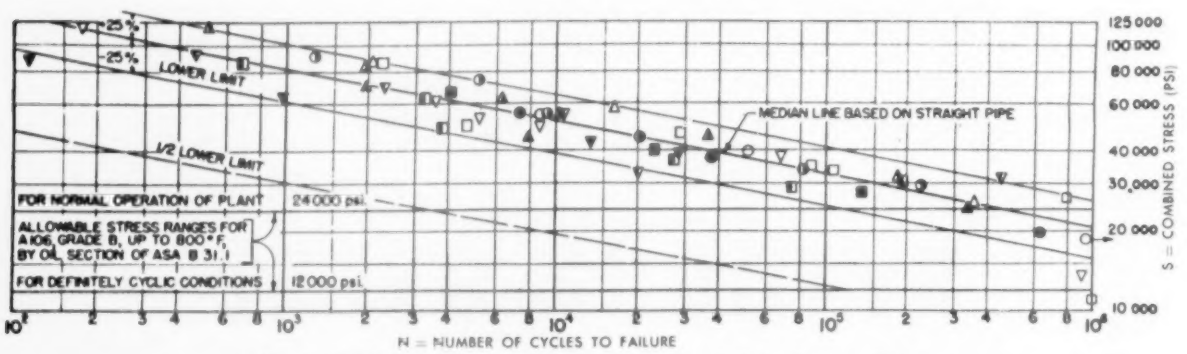

Fig. 1—Correlation of endurance strength with A.S.A. Code for Pressure Piping.

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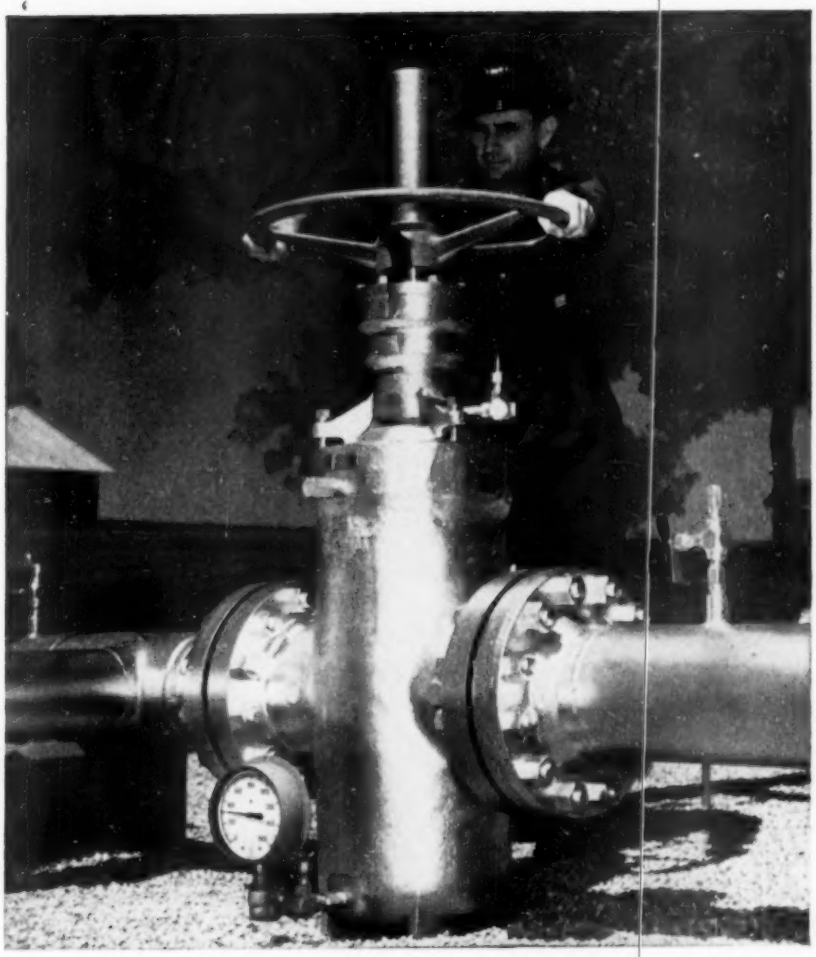

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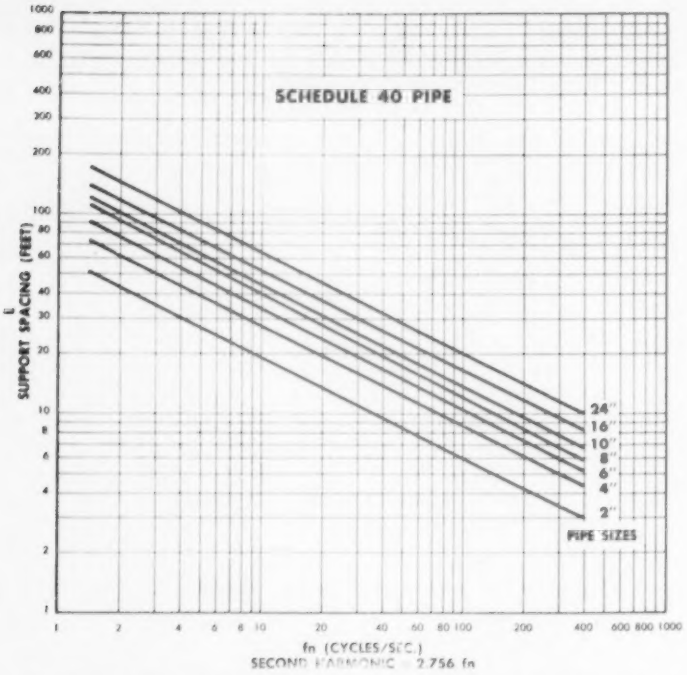


Fig. 2—Natural frequencies of pipe spans clamped both ends (calculated).

PIPE SIZE (NOMINAL) INCHES	1	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
MAXIMUM SPAN FEET	7	9	10	11	12	13	14	16	17	19	22	23	25	27	28	30	32

Fig. 3—Maximum spacing between pipe supports (based upon bending stresses and deflection. Use for Schedule 40 pipe).

can develop in piping when unpredicted vibrational stresses are superimposed upon the normal cyclic and static stresses.

Stress intensification . . . In addition to decreasing the predicted safety factor when a piping system operates under dynamic stress conditions, there are stress-intensification factors that limit the operating safety of the plant, but they are difficult to predict during design phases:

1. Stress concentration.
2. Notch sensitivity.

The stress-concentration points are caused by discontinuities in the members, which may be found at welds, flanges, elbows, and due to the geometry of the piping. Therefore, it is necessary to keep fillet radii as large as practical and properly reinforce stress concentration points, such as nozzles, etc.

Notch sensitivity is a characteristic of most metals that can result in localized stresses in excess of the predicted values. These stress-concentration points may be caused by such irregularities such as surface nicks, arc marks, laps in the pipe wall, etc. It is important to carefully inspect piping that will be operated under dynamic stress conditions in order to prevent failure from this source.

Conventional Practice in Compressor-Plant Piping Design

The major steps in compressor plant piping design are the determination of:

1. Pipe and vessel sizes.
2. Wall thicknesses.
3. Pipe support and hanger locations.

The diameters of the suction and discharge laterals and headers are determined on the basis of allowable pressure drop, which, of course, is based upon economic considerations. In some cases it has been found desirable to use line sizes somewhat larger than normally would be required for smooth flow, since the presence of pulsations in piping tends to increase pipe friction.

Suction and discharge manifold bottle diameters are normally fixed by volume recommendations that are made by the compressor manufacturers. In many cases the volumes are determined by using a multiple of the compressor-cylinder displacement to determine the minimum volume requirements.

Pipe and vessels . . . The wall thicknesses of the piping and bottles are calculated on the basis of the allowable stresses that are specified in the codes, such as A.S.A., A.P.I.-A.S.M.E or A.S.M.E.

Pipe-support and hanger locations are usually determined by considering the pipe runs as continuous spans, and placing the supports at intervals that will keep the bending and thermal stresses in the pipe within the limits that are specified by the codes. In addition it is necessary to maintain the deflection in the span at a minimum to prevent the collection and pocketing of liquid at these points. Simplified charts have been prepared that take both stresses and deflection into account.[11 12]

Solutions to the Pipe Vibration Problem

The foundation for a reciprocating engine compressor unit must perform three functions:

1. Support the weight of the unit.
2. Maintain proper alignment.
3. Absorb vibrations.

The absorption of vibrational forces is probably the most important of the above requirements; therefore, the foundations must have sufficient mass or weight to absorb vibrations. Theoretically the minimum weight required could be expressed as a function of the weight of reciprocating masses and engine speed. Practically, this is seldom done, and empirical formulas are normally used.[1]

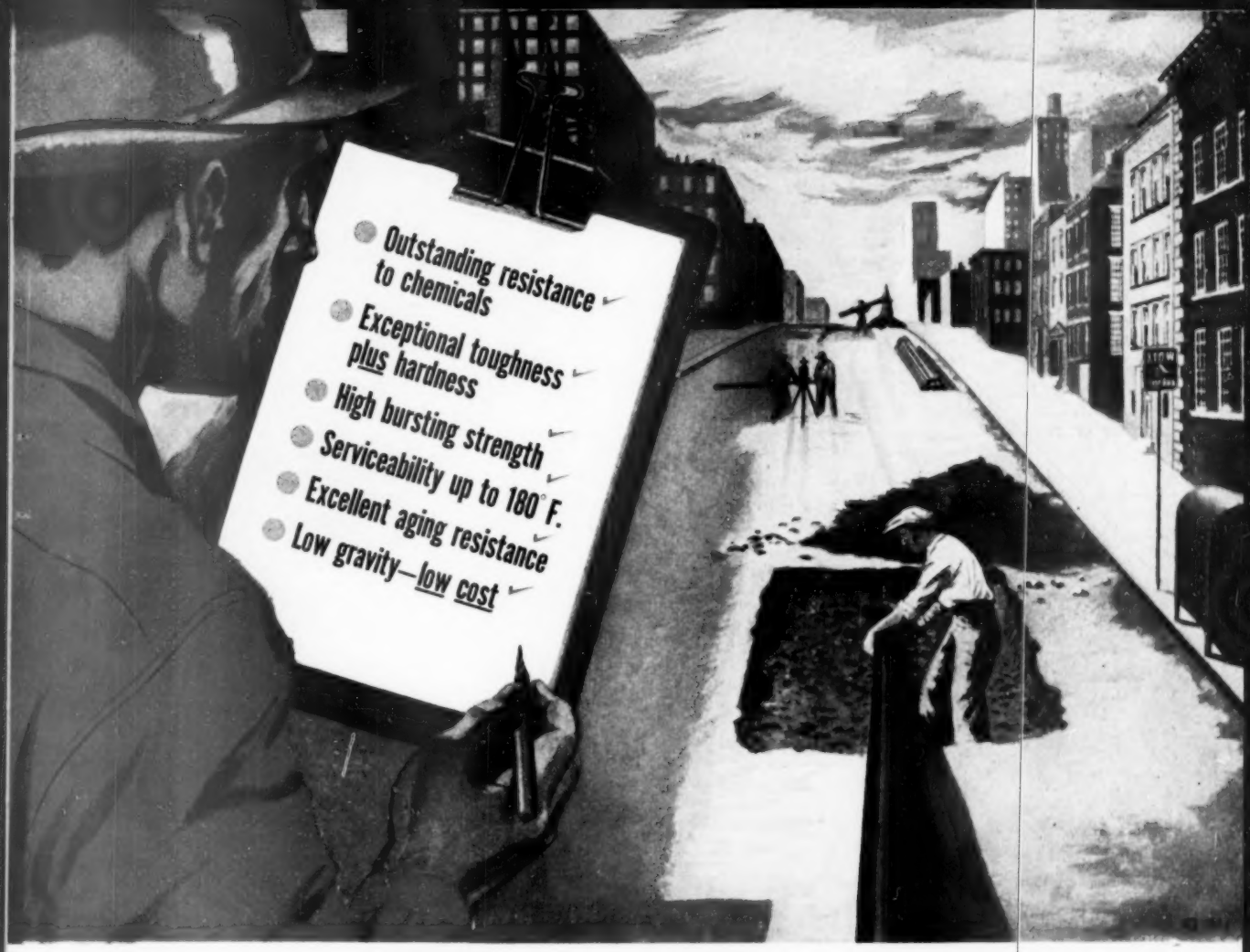
To minimize pulsations . . . The best solution to the problem of piping vibrations due to pulsations is the isolation of the piping from the pressure surges that are produced by the compressor.

The usual methods of minimizing pulsation in the gas streams are as follows:

1. Pulsation dampeners.
2. Pulsation-dampening piping systems.
3. Adequately sized volume bottles.
4. Increasing diameters of compressor-plant piping.

The most efficient method of decreasing gas pulsations in the piping is to use pulsation dampeners or π-type low-pass filters.[4] Equally efficient are the pulsation-dampening systems that incorporate the elements of the pulsation dampeners in the design of a complete compressor piping system. This is accomplished by utilizing the manifold bottles, laterals, and headers as the components of a low pass filter. Properly designed pulsation dampening equipment can decrease the magnitude of pulse pressure from the cylinders by 85 per cent or more.

Manifold bottles . . . The installation of adequately sized manifold or volume bottles is another conventional practice



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in gas-compression-piping design to decrease pressure pulsations. However, it has been reported that the pulsations going into the piping will be twice as large with a carefully designed volume bottle as with a comparable pulsation dampener or π-type low-pass filter.

The size of the volume bottle must be given careful consideration to prevent magnifying pulsations. Misguided addition of a surge chamber may merely lower the natural frequency of the piping system so that the frequency can coincide with the important harmonic of the compressor speed. Then the total pulsation of the gas can be increased from forced oscillation to a more severe resonant vibration. Therefore, the practice of designing surge chambers (manifold bottles) by using a multiple of the displacement of the cylinders seems hazardous.

Another method of minimizing the effects of pressure pulsations in the gas stream is by increasing piping diameters in excess of the sizes that would be required for "smooth flow." This practice compensates for the increase in pressure drop that is inherent with pulsative flow, and increases the stiffness of the piping to decrease the vibrations that are induced by pulsative flow conditions.

Selection of Piping Spans to Minimize Vibration

In the design of the pipe-span lengths it would be desirable to have a measured frequency analysis of the mechanical and pulsation frequencies in the piping; however, this is seldom practical in engineering work. Therefore, an estimate of the design frequency can be based upon the engine harmonics and pressure pulse frequency harmonics. These harmonics may be determined by constructing a vector diagram of the engine forces with the proper crank-angle relationship.[2] A similar diagram can be made to determine the most serious pulsation frequency.[5,7]

Based upon a large number of field measurements, a rough approximation of the upper limits of the highest harmonics can be made as follows:

1. Highest engine frequency—four times the firing frequency of the engine.

2. Highest pulse frequency — four times the "puff" frequency from the compressor cylinders.

The above relationships must be used only as guides for estimating support requirements. For final design apply the vector diagram method of analysis.

Piping spans . . . For the purpose of locating pipe supports to minimize the effects of vibrations due to mechanical excitation or pulsations in compressor plant piping, we suggest the following procedure that will result in a piping system wherein the critical speed characteristics of the piping are above the most serious harmonics of the forcing frequency.

1. Measure or estimate the highest mechanical and pulse frequencies in the system as discussed above. Use the highest of the two for determination of support locations.

2. For pipe-support spans with **clamps** at each end of the span, enter Fig. 2 on the abscissa at the design natural frequency of the pipe span (fn) so that

$$\frac{f}{fn} = 0.5 \text{ or } fn = 2f$$

where,

fn = natural frequency of pipe span
f = maximum exciting frequency

Read up to the pipe diameter under consideration, and the recommended length of the pipe span will be found on the ordinate in feet span.

3. Compare the above value to the **maximum** allowable pipe spans that are shown in Fig. 3. These values will maintain stresses in the pipe wall below normal code values, and the deflection will be negligible.

4. In the final location of the support spacing, experience indicates that the spacing should be varied with a range of about 10 per cent below the calculated maximum span so that adjacent spans will not have identical spacings for the diameter of pipe under consideration. If the calculated maximum span is 12 ft., the adjacent span should be about 11 ft. in order to decrease synchronous vibrations.

5. Calculate the thermal expansion of the pipe. This will indicate the type of holddown clamp or anchors, and the locations in order to minimize thermal stresses in the piping. It is desirable to keep these stresses low, because they act as compression on a restricted span to lower the natural frequency.

Recommendations for Compressor-Plant Piping

The following recommendations will provide conservative designs and aid in decreasing the magnitude of vibratory conditions.

1. Minimize the source of mechanical vibrations by proper balance of the compressor unit, and provide adequate foundation to absorb the residual vibrations in accordance with the soil bearing conditions and the engine manufacturer's recommendations.

2. Decrease the vibrations that are caused by pulsative flow conditions by attenuating the gas pulsations as close to the compressor as possible. Preferably use pulsation dampeners.

3. Place pipe supports and holddowns at intervals that will maintain the natural frequency of vibration of the pipe spans above the highest major engine or gas pulsation harmonics.

4. Provide adequate footing for the concrete pipe supports to prevent "rocking." This will decrease coupling of vibrations from one run of pipe to parallel spans, when a common support is used for several lines. In addition keep the projection of the support above grade as short as possible for maximum stiffness of the support.

5. Use sturdy holddown clamps, guides, and anchors that have a high degree of stiffness and high natural frequency. Place supports, guides, holddowns, or anchors at all changes in direction of the piping within limits of required pipe flexibility and thermal expansion.

6. The footing for the steel beam and overhead pipe supports must be adequate to minimize "rocking." The stiffness of all structural members should be as great as possible.

7. Extreme care must be exercised to be certain that the pipe is resting firmly on the pipe support and not pulled down to the support by the clamps, hold-downs or anchors. In all cases use shims to correct any errors in elevation of the pipe supports.

8. In cases where a number of various sizes of pipes use the same support, design the span between adjacent supports so that the natural frequency of vibration of the smallest-diameter pipe will be above the range of engine and compressor vibration and pulsation harmonics. If this is not possible because of economic or practical limitations, it has been found helpful in some cases to firmly tie the smaller-diameter pipe to an adjacent larger pipe. This practice must be used with extreme caution, because it can result in coupling vibration from the smaller pipe to the larger and accentuating the problem; therefore, this approach should be reserved as a field expedient for correction and not a design practice.

9. Thermal stresses in the piping should be kept at a minimum by the proper selection of holddown clamps, expansion loops, etc.

10. "Cold springing" should not exceed the limits that are specified by the A.S.A. Code, generally one-half the theoretical thermal expansion.

11. Place expansion loops and bends horizontal wherever possible. In all cases support the bends at the center of the loop, but do not restrict movement due to thermal expansion. Place guides at several locations adjacent to the bend or loop at locations that will

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not seriously restrict thermal expansion.

12. Use a minimum of elbows. If it is necessary to connect the laterals and headers at different elevations, use 45° ells instead of 90° ells in cases where piping flexibility is not critical.

13. Support all heavy valves, flanges, and piping configurations, such as by-pass piping, in order to keep static bending stresses and deflection in the pipe at a minimum.

14. Support the discharge bottles under each compressor nozzle to prevent movement of this relatively large mass that can transmit vibratory movement to the allied piping. In addition, keep the length of nozzle as short as possible for both mechanical and acoustical reasons.

15. Keep the nozzles on the suction bottle as short as practical for the highest natural frequency in the system. In addition, in the normal case where the suction manifold bottle is located above the cylinders, the unsupported mass of the bottle must be kept within limits that will not cause deflection in the compressor cylinder supports and discharge manifold bottles. If additional volume is required above the limits set by the allowable mass of the bottle, use an oversized riser pipe or a two-bottle pulsation dampener design.

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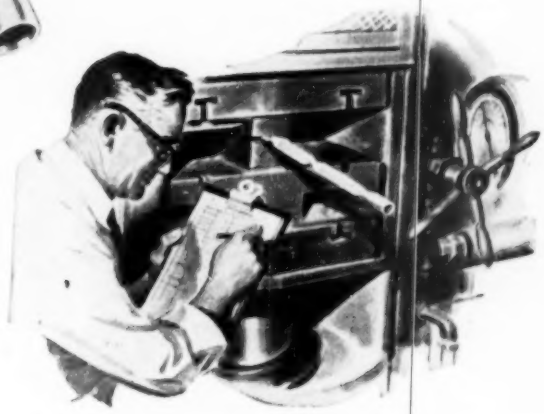

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Cooling-Tower-Wood Maintenance

(Continued from page 81)

rings. Microscopic examination shows that the summerwood was attacked first and was selectively degraded, leaving the springwood in integral laminates. (Fig. 6.)

Chemical analysis showed that cellulose had been selectively removed. In those towers in which this type of degradation exists, the possibility that chemical action was the sole cause of this form of degradation was considered and laid aside since no chemicals were generally known to be present which could selectively remove cellulose under these conditions. Fungi were isolated from specimens showing this type of degradation. The probability of increase in the intensity of attack has been found to increase with increases in pH or chlorine residuals, which conditions are known to remove, or reduce, the natural toxic extractives in the wood.

It is inferred from this correlation that unfavorable combinations of pH and chlorine react rapidly with extractives near the surface of the wood and lower the concentration of extractives near the surface. An extractive gradient is thereby established which gradually lowers the extractive content within the piece. The resulting internal conditions apparently reach a condition not unfavorable to the development of fungi, even though the same fungi are not able to develop on the surface due to unfavorable conditions, such as excessive moisture, chlorine, or high pH.

It is concluded that this form of degradation represents the end result of fungal action, with chemical action as a precursor.

In the towers under consideration in this report, this form of deterioration was found in greatest intensity in the nonflooded portions of the tower on the leaving-air side of the water-distribution system.

Operating Conditions

An analysis of the field data of the 1951 survey has been made in an effort to correlate the observed conditions of the tower with the operating conditions. The data show the following correlations between the operating conditions and the intensity of the various types of attack.

Design of tower . . . Both types of surface attack and internal attack appear in all designs of towers at the same general level of intensity. No significant difference was found between average deterioration rates for different tower designs.

Plant served by tower . . . All types of attack have been found in towers serving the petroleum refining, the general chemical manufacturing, and the utilities industries. No correlation between type of attack and type of service was apparent in this study.

Age of tower . . . An analysis of the extent of surface attack as a function of age shows that this is not a straight-line relation. The data show that the rate of deterioration per year is highest in new towers and tends to decrease with age. This may be explained by the fact that a layer of degraded wood on the surface may retard further degradation, particularly the chemical surface attack, since the degraded wood forms a protective coating which reduces further attack into the unaffected wood. Another explanation for the data showing a decreasing annual rate of surface attack is that it is extremely difficult to evaluate the amount of wood substance lost in older towers. The sizes of original members are not known and there is likely a tendency to underestimate the severity of attack in older towers. Biological attack, where it appears at all, shows approximately

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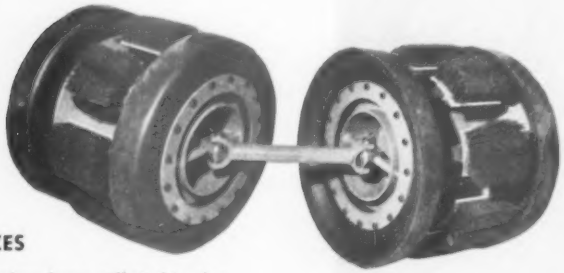

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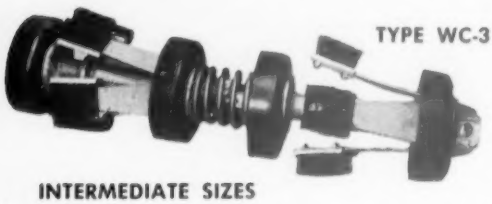

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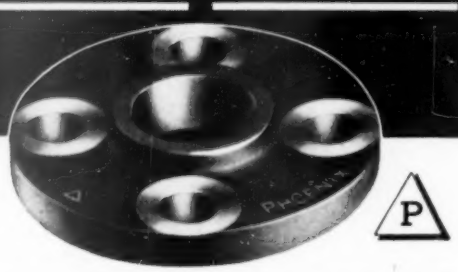

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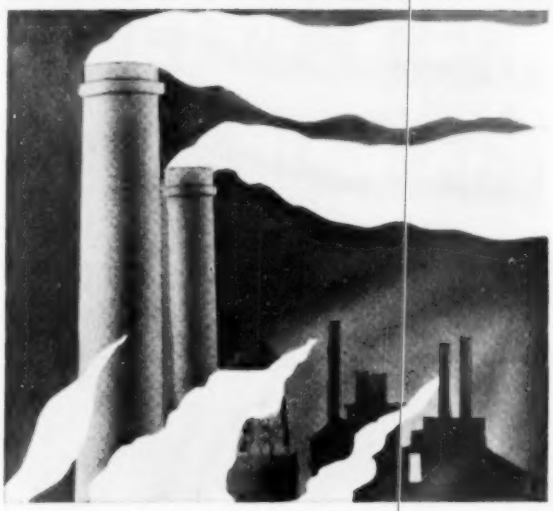

Study Of Meteorological Conditions Above New Plant Site Urged

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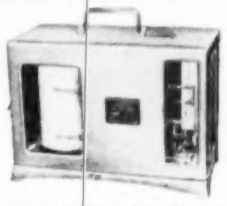

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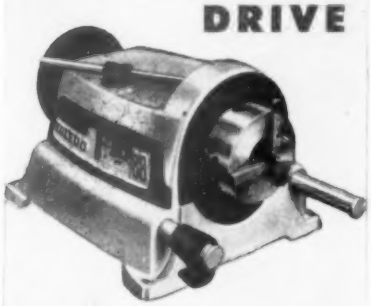

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a straight-line correlation with age. (Figs. 7a, 7b, and 7c.)

Temperature . . . The rate of surface attacks increases as inlet water increases. Internal attack shows a close correlation to wood temperature in the areas in which it occurs. This type of attack is generally confined to wood having a temperature of 88° to 105° F. This type of attack also shows a close correlation with inlet-water temperature, being limited almost exclusively to the inlet-water temperature range from 103° to 120° F. in the geographical area studied.

pH of circulating water . . . Although pH is not the sole criterion in chemical attack, the data show that the rate of chemical attack increases with increases in pH. It should be noted that the rate of deterioration is dependent upon the chemical constituents which determine the pH, coupled with the influence of other variables of the system. However, the data have shown that in general the deterioration is minimal in the pH range of 7.0 to 7.5. (Fig. 8.)

Algaecides . . . Chlorine was the only algaecide which was used in a sufficient number of towers to permit correlation between algaecide concentration and deterioration rate. The correlations for both surface and internal degradation show close similarity. As chlorine concentrations are increased from 0 to 1 p.p.m. at pH of 6.0, the rate for both types of deterioration increases very slightly.

As chlorine concentrations are increased over the same range at pH of approximately 7.5, the rates of deterioration decrease. If chlorine concentrations are increased from 0 to 1 p.p.m. at pH in the range of 9.0, the rates of deterioration increase markedly. The correlations show that as chlorine concentrations are increased, at pH either above or below 7.5, the surface deterioration is increased more rapidly than is the internal deterioration.

Approximately 1 p.p.m. chlorine residual at a pH between 7.25 and 7.5 produced a minimum total deterioration from both causes. In towers using chemicals other than chlorine as an algaecide or no algaecide, the limited data showed that in 80 per cent of the towers observed surface attack was almost constant regardless of the pH of the circulating water.

Nutrient salts . . . There is a possibility that certain salts in the water may aid in increasing the intensities of attack. Phosphates, which are used for scale control, are an excellent culture medium for fungi.

Sulfates are also present in most

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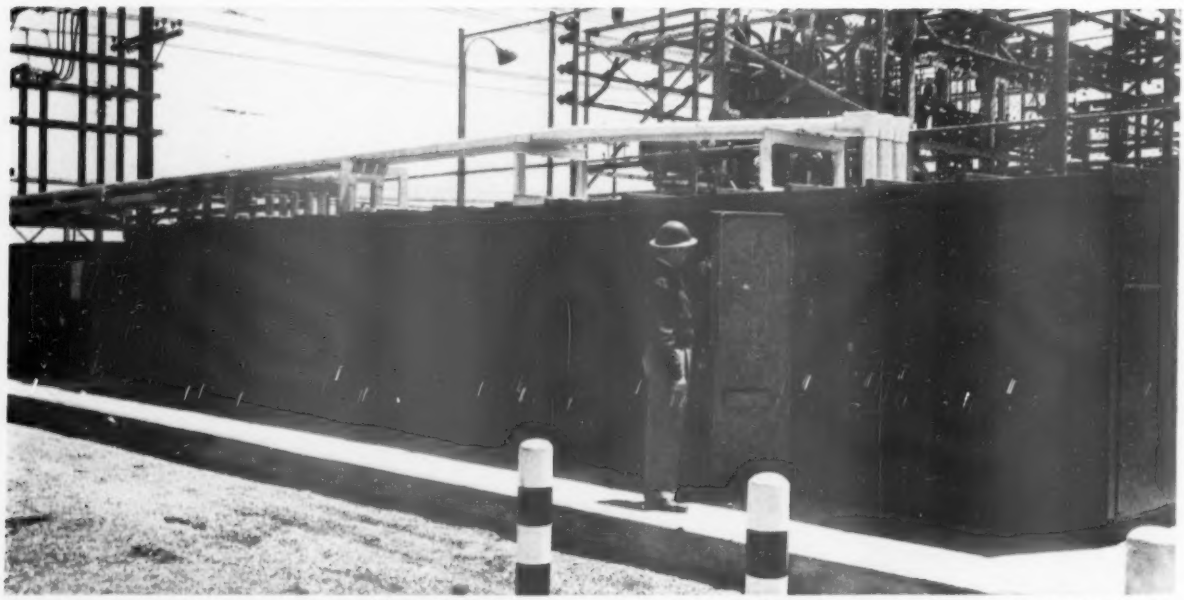

COMPACT, OUTDOOR METAL-CLAD SWITCHGEAR in foreground is the main distributing point of power to Union Oil's Wilmington refinery. Providing primary circuit protection, these compact G-E units are factory-assembled and shipped ready to install. They're simple to operate and maintain because of a fast, vertical-lift system of breaker removal.

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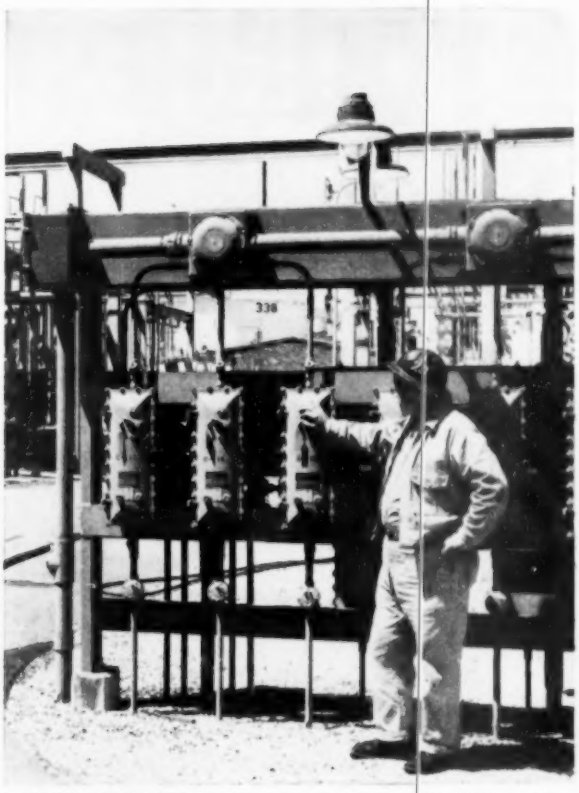

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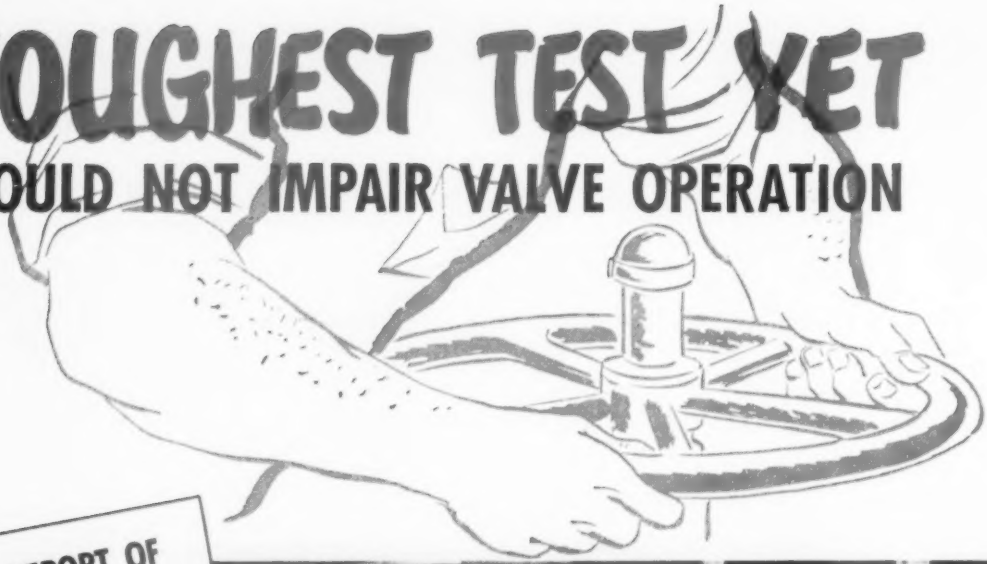
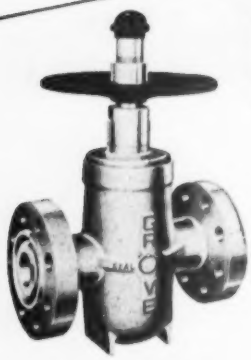


A FULL REPORT OF ACCELERATED LIFE TESTS WILL BE FURNISHED

—by major gas transmission and producing company conducting this test



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cooling-tower waters and these salts are used as food by fungi. However, no definite correlation was found between these salts and the various forms of degradation. These apparently minor points should be given consideration in severe and otherwise unexplainable cases of deterioration. Otherwise, it is felt that they may be neglected.

Erosion . . . Simple erosion has been considered as a possible cause of surface deterioration but field data indicate that erosion by itself is of negligible significance as a deterioration agent. It may be assumed that erosion coupled with the effect of the minor characteristics of the circulating water account for only a small increment of the total loss of wood due to deterioration.

Control of Deterioration

Chemical attack of cooling-tower wood may be controlled to a large extent by water treatment. It would appear that high alkalinity and high pH values result in chemical attack. It is also known that sodium carbonate is a contributing influence in this connection. Oxidizing agents will destroy the lignin and some of the other components of the wood. The studies conducted by the Cooling Tower Institute indicate that the pH value should be maintained between 7 and 7.5.

Some operators have found that sodium carbonate in excess of 100 p.p.m. is detrimental. Proper treatment of circulating water can prevent chemical deterioration or stop progression of the attack. The fact that biological attack seems to be more prevalent in towers operating with a high pH value may indicate high alkalinity encourages leaching that lowers the resistance of the wood to decay.

The incidence of decay is probably due largely to chance infection, but it is known that the resistance to attack is lowered as a result of the normal leaching that takes place. Water-treating practices which prevent chemical attack will minimize the possibility of biological infection but will not positively prevent it. Changing the water treatment will not stop the infection if it is already present.

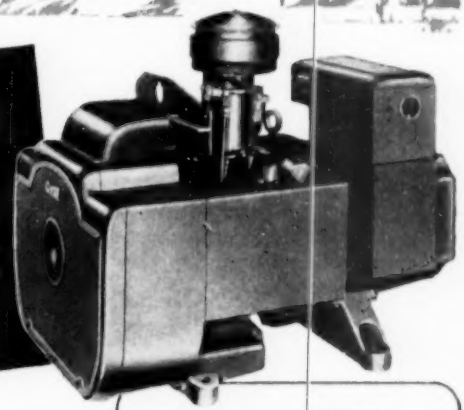
Adequate sanitation measures are recommended as a regular practice. These should include periodic inspections of the wood, removal of algae, mud, and other deposits, and general cleansing of the cooling-tower system as a whole. Infected wood should be removed from the cooling tower as soon as it is discovered. (Fig. 9.)

Conclusions

- Proper water treatment can prevent excessive chemical deterioration

Forging Stronger Links in Microwave Relay

ONAN STANDBY ELECTRIC PLANTS



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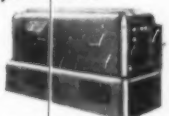

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and at the same time minimize the possibility of infection by wood-destroying organisms. This means that the pH value should be held between 7 and 7.5; the concentration of sodium carbonate may be controlled by the use of sulfuric acid to convert it to sodium sulfate; and the chlorine residual should be maintained below 1 p.p.m.

- The possibility of infection by wood-destroying organisms cannot be predicted although conditions favorable to chemical deterioration seem to make the incidence more prevalent. The infection may occur in any part of the cooling tower regardless of make or type. The prevalence of decay is not sufficient to warrant the recommendation that treated lumber be used in cooling towers.
- High operating temperatures serve to intensify the surface attacks. (Fig. 11.) Correlated data indicate that the fungal action is apparently most severe when the temperature within the wood ranges from 88° to 105° F. These wood temperatures usually correspond to inlet water temperatures from 103° to 120° F.
- Both forms of deterioration have been found in a wide variety of plant services, and it is felt that any correlation between rate of wood deterioration and type of service is not of economic significance.
- Minor water characteristics, such as phosphate and sulfate content, may well have a bearing on the rates of degradation since these salts are fungal foods. However, for the average tower, it is felt that their significance is of minor economic importance.
- Erosion, particularly in the case of high suspended solids in the water, may have some slight effect in wearing away the wood, but for the average tower the result of this action is apparently significant.
- If pH is held between 7.25 and 7.50, with chlorine residuals of approximately 1 p.p.m. and inlet-water temperature below 120° F., the total wood lost by all types of deterioration studied would be expected to be minimal.

Member companies in the Cooling Tower Institute are: (1) Fluor Corp., Ltd.; (2) Foster Wheeler Corp.; (3) Hudson Engineering Corp.; (4) Lilie-Hoffman Cooling Towers, Inc.; (5) Marley Co.; (6) J. F. Pritchard & Co.; (7) United Cooling Tower Co.; (8) Water Cooling Equipment Co.; and (9) C. H. Wheeler Manufacturing Co.

Acknowledgments

The contributions of former committee members, W. W. Akers, D. R. Baker, and J. Lichtenstein, in this study are gratefully acknowledged. The cooperation of those cooling tower uses in the Gulf Coast area who have made their towers available for study, and the cooperation of the California Redwood Association are sincerely appreciated.

Thanks are hereby extended to H. J. Voorhies and J. C. Hill, Esso Standard Oil Co., Baton Rouge, for the use of photographs used as Figs. 2, 6, 9, and 10; to the California Redwood Association, San Francisco, for wholehearted cooperation and use of photographs used as Figs. 1a and 3; to the Institute of Paper Chemistry, Appleton, Wis., and Dr. F. B. Shema, research assistant, for technical guidance and photographs used as Figs. 1b, 4, 5, 6, 7a-c, and 8; to T. L. Satterfield, A. W. Whitaker, and Roy V. Comeaux, Humble Oil & Refining Co., Baytown, Tex.; and to U. S. Forest Products Laboratory, Madison, Wis., for analyses of wood samples and making available laboratory publications on this subject.

Other Articles on This Subject

The Effect of Circulating Water on Wood in Cooling Towers, J. C. Hill, Esso Standard Oil Co., Baton Rouge. Presented at symposium on cooling towers, Engineers Society of Western Pennsylvania, Pittsburgh, October 1952.

Deterioration of Redwood Cooling Towers, Roy V. Comeaux, The Oil and Gas Journal, September 21, 1953.

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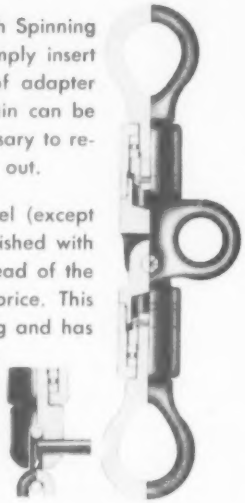

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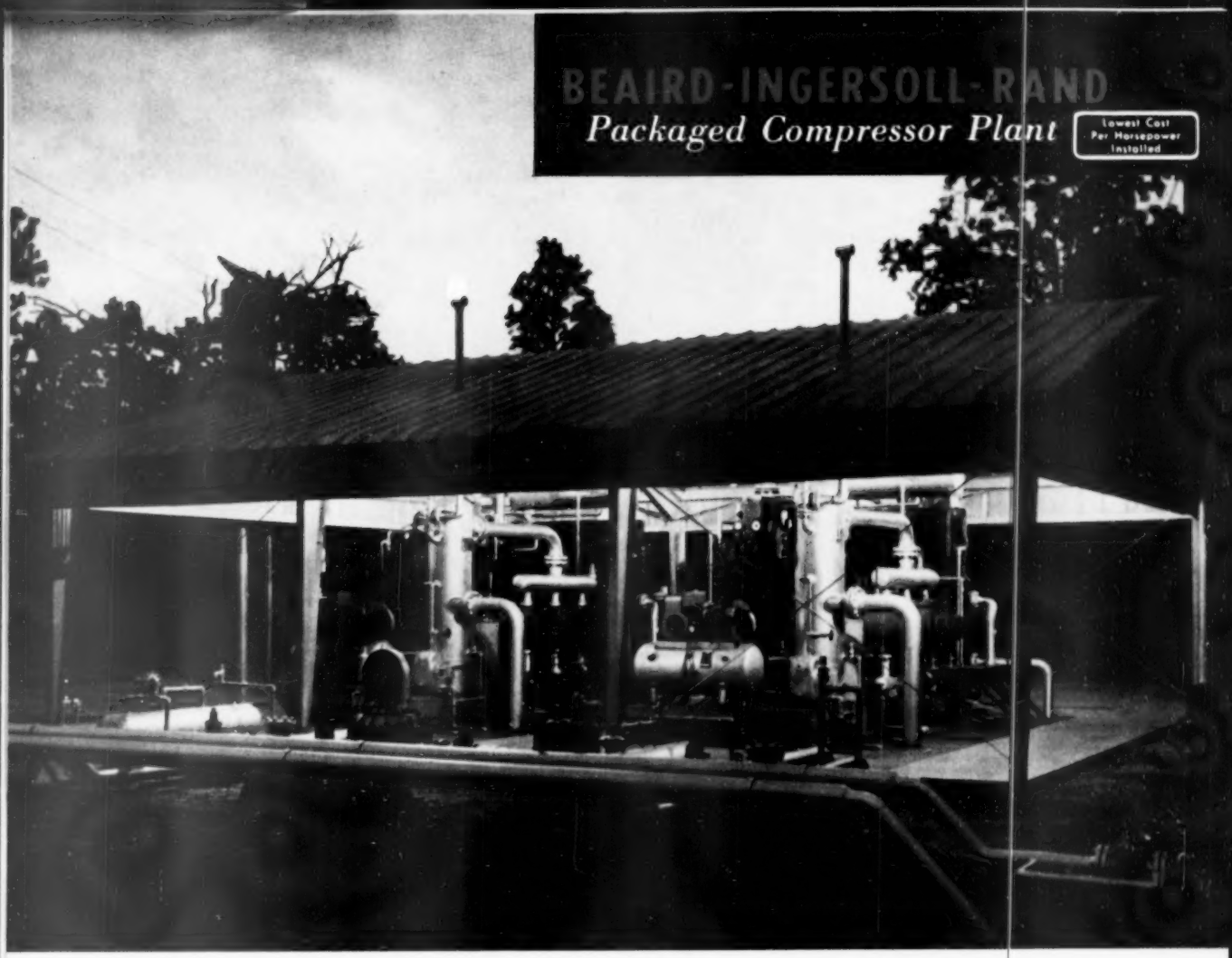

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Simplify Your Oil and Gas Calculations—3

by Louis J. Murphy
International Engineering Associates, New York

Chart 3 here presented makes it easy to determine heat requirements when heating a gas. The example for use with this chart was given in Installment 1 of this series.

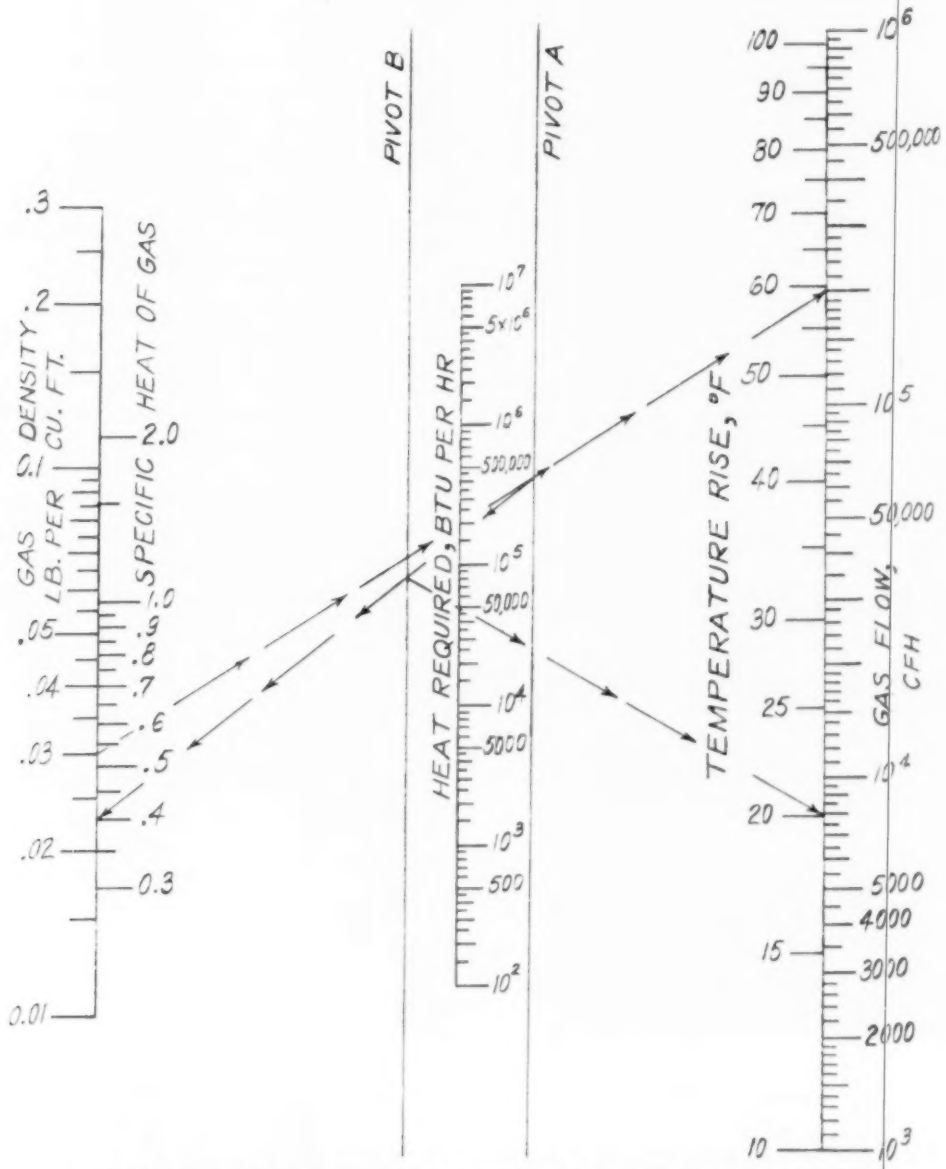

Chart 3—Nomograph for determination of heat required to raise the temperature of a given quantity of gas from a given inlet to a given outlet temperature.

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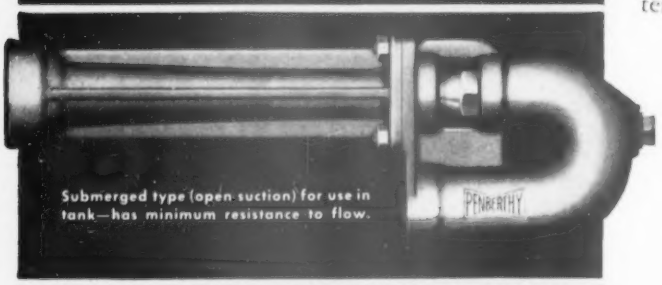

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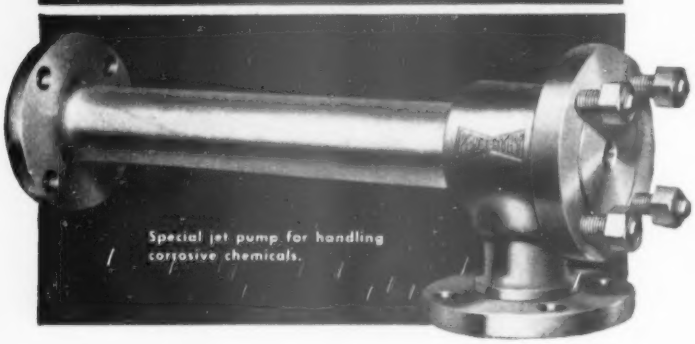
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How to Design and Evaluate Absorbers—9

by R. J. Hull and K. Raymond

THE sample design calculation for the 40-900-psig. range is concluded in this installment.

L. From Fig. 6, at 6.2 B.t.u. per pound lean oil and 20 trays:

$$T_{AV} = \frac{T_{LO} + T_{RO}}{2} = 18^\circ \text{ F.}$$

Using T_{RO} from Step J:

$$T_{AV} = 88 + 18 = 106^\circ \text{ F.}$$

M. $(L/V)_{TOP} = L_1/V_{D1} = 5{,}056/33{,}996 = 0.149$.

N. Obtain multiplier for corrected $(L/V)_{BTM}$. Multiplier is equal to 1.000 plus the fractional shrinkage of propane and heavier per theoretical tray.

$$\text{Multiplier} = 1.000 + \frac{1{,}681}{37{,}000 \times 6.6} = 1.000 + 0.007 = 1.007$$

O. For second trial assume shrinkage = 3,000 M.c.f. per day, then:

$$(L/V)_{BTM} = 1.007 \times \frac{3{,}635 + 3{,}000}{37{,}000} = 0.180$$

$$P.\ (L/V)_{AV} = \frac{(L/V)_{TOP} + (L/V)_{BTM}}{2} = \frac{0.149 + 0.180}{2} = 0.164.$$

Q. Compute second trial shrinkage scaling temperatures from T_{RO} to T_{AV} and (L/V) ratios from $(L/V)_{BTM}$ to $(L/V)_{AV}$ according to Fig. 8. Use 37 per cent efficiency for propane (7.4 theoretical trays) and 33 per cent efficiency for butanes (6.6 theoretical trays). Compute rich-oil molecular weight and A.P.I. gravity to obtain correction factor for methane equilibrium constant:

$$(M.W.)_{RO} = \frac{2{,}341 \times 378.6}{6{,}639} = 133$$

$$(\text{lb./gal.})_{RO} = \frac{2{,}341 \times 1{,}000}{367{,}180} = 6.376$$

or 53.3° A.P.I.

Correction factor = 0.96

The calculated shrinkage (see Table 1) is within 1 per cent of the assumed value. Comparison of the new rich-oil composition with the first trial composition shows only minor changes, therefore, no additional calculations are necessary and the heat balance values already calculated may be taken as is.

2. DESIGN CALCULATION IN 1,400-2,100-PSIG. RANGE

The steps are similar to those in the 40-900-psig. range except:

A. Rich-oil temperature, T_{RO}, is obtained directly from Fig. 4.

B. T_{AV} is taken equal to T_{RO} and calculations are made to a check on assumed shrinkage. Care should be taken to develop precise K values for methane, and to run all calculations to essentially perfect checks on each assumed shrinkage.

C. Heat and material balance is made and T_{RO} is calculated.

D. T_{AV} is obtained from T_{RO} and T_{OO} by use of Fig. 7.

E. The calculation is repeated if necessary with the final T_{AV}.

As stated before, calculation time for the complete procedure in either pressure range takes about 3-4 hours. Successive calculations on similar compositions, pressures, oil rates, etc., take 1-2 hours or less.

References

1. Webber, C. E., A.I.M.E., Tech. Pub. No. 1252 (1940).
2. Kellogg Equilibrium Charts, Chem. Eng. Progress 46, No. 3, 20 (1950).

TABLE 1—SAMPLE DESIGN CALCULATION

	First shrinkage trial					Material quantities based on first shrinkage trial						
	V_{IG} M.c.f. per day	K, at 110° F. and 635 psia.	Abs. factor $A = (L/V)_{BTM} \times 1/K$	Per cent rec. 6.6 theo. trays	S M.c.f. per day	S M. lb. per day	B.t.u. per lb.	M. B.t.u. per day	$(V_{IG} - S) = V_{DO}$ M.c.f. per day	V_{DO} M. lb. per day	L_{RO} M. lb. per day	L_{RO} M. gal. per day
CO_2	185	2.95	0.063	6.3	12	1	69	69	173	21	1	216
C_1	30,998	6.40×0.99	0.029	2.9	905	38	65	2,470	30,093	1,276	38	15,385
C_2	2,901	1.32	0.140	14.0	406	32	144	4,608	2,495	198	32	10,353
C_3	1,846	0.48	0.386	38.6	712	83	138	11,454	1,134	132	83	19,580
iC_4	252	0.232	0.798	76.5	193	30	132	3,960	59	9	30	6,311
nC_4	422	0.171	1.082	90.0	380	58	132	7,656	42	7	58	11,970
C_5+	396				396	83	123	10,209			83	15,365
L.O.											2,016	288,000
	37,000				3,004	325		40,426	33,996	1,643	2,341	367,180

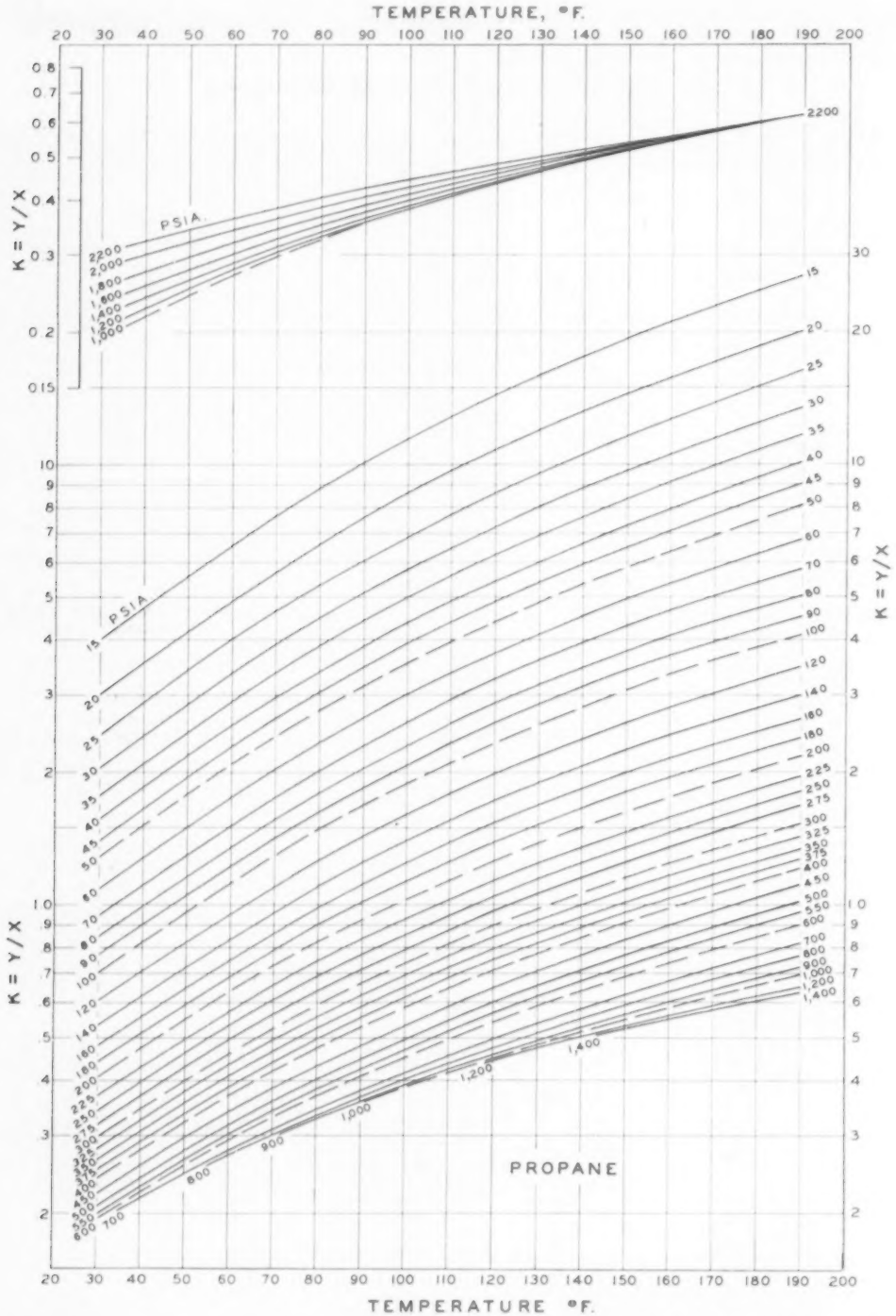
SECOND SHRINKAGE TRIAL—AFTER HEAT BALANCE

	V_{IG} M.c.f. per day	Temp. °F. for K	K 615 psia.	(L/V)	A_E	Per cent recovery	S M.c.f. per day
CO_2	185	96	2.74	0.179	0.065	6.5	12
C_1	30,998	95	6.30×0.96	0.179	0.0296	2.96	918
C_2	2,901	97	1.21	0.177	0.146	14.6	424
C_3	1,846	101	0.44	0.172	0.391	39.1	722
iC_4	252	104	0.215	0.166	0.772	73.2	184
nC_4	422	106	0.163	0.164	1.006	87.0	367
C_5+	396						396
	37,000						3,023

Authors are with California Research Corp., La Habra, Calif. Paper presented at California Natural Gasoline Association meeting, Los Angeles, October 8-9.

Propane equilibrium constants . . . This chart is based on the data of Webber,[1] Katz and Hachmuth, and our own experimental results. Although propane K values are affected above 200 psig. by phase compositions within the range of compositions encountered in this work, the chart gives values suitable for most systems.

The values cannot be used with accuracy for systems derived from an intake gas composed, for example, of 50 per cent methane, 20 per cent ethane, 20 per cent propane, and 10 per cent butanes and heavier. For such rich systems, propane equilibrium values can best be taken from the Kellogg[2] fugacity charts for light hydrocarbons. It should be noted that the Kellogg charts are not suitable for normal absorption oil systems because the liquid phase is not light enough to behave as a "light" hydrocarbon mixture.



Equilibrium constants for propane. Reference: C. E. Webber, Pet. Tech. Nov. 1940: Katz and Hachmuth, Ind. Eng. Chem., 29, 1072 (1937).

ELECTRIC LOGGING—17

Four-Electrode Spacing

by R. I. Martin

PREVIOUS installments having described conventional resistivity curves, it will be convenient to show the spacings used, graphically. Fig. 1 shows four electrodes, I through IV, which are connected to the surface equipment through a four-conductor cable. Electrode arrangements which are possible are shown in the three diagrams to the right.

The normal and long normal may be recorded simultaneously, together with an S.P. curve. Current electrode A is the common source of current for both pickup electrodes M_1 and M_2 corresponding to the normal and long normal. The distance AM_1 may be 16 in., while AM_2 is 64 in. The return current electrode B is placed in the hole instead of at the surface of the ground. Its distance from M_1 and M_2 is sufficiently large compared with the distances AM_1 and AM_2, that its presence is not disturbing in normal cases. It was shown earlier that most of the potential drop takes place close to electrode A. When the formations are very thick and highly resistive, however, its presence in the hole produces undesirable effects, which will be discussed later on.

The reason for placing current electrode B in the hole is as follows. Besides measuring induced potentials, electrode M, is also used to measure the natural or spontaneous potential found in the bore hole. To make this possible, the applied potential is an alternating one generated by a rotary converter known as a pulsator. The pulsator also separates the returning signals so that both the resistivity and S.P. curves may be obtained. If A were the only current electrode in the hole, inductive coupling between the conductor for A and that for M would give rise to undesirable potentials in the circuit for M. By putting two current electrodes in the hole, the conductor for M is subjected to two opposite, and practically equal, inductive forces, which therefore neutralize each other almost completely.

In order to obtain a three-electrode curve with this arrangement the electrodes may be connected as shown at the extreme right. For convenience the electrode arrangement is always referred to as AMN or AO even though the arrangement is not exactly as shown. The distance AO may be 18 ft. 8 in. when AM_1 and AM_2 are 16 and 64 in. respectively. This gives a ratio of MN to AO of one to five. That is, MN is small in comparison with AO.

In practice the reciprocal arrangement is used. Current electrode A replaces M, electrode B replaces N, pickup electrode M replaces A while N replaces grounded electrode B. These changes do not affect the response of the logging arrangement, which continues to behave as before. The reason for this is difficult to see in this case, but it may be demonstrated both mathematically and experimentally. In the case of a four-conductor network such as a Wheatstone bridge the calculation is simple. This cyclic rearrangement is based on the principle of reciprocity which may be stated:

In any conductor or system of conductors having four terminals 1, 2, 3, and 4, selected in any way, the difference of potential between 1 and 2 caused by the passage of current between 3 and 4, is equal to the difference of potential between 3 and 4, due to the passage of the same current between 1 and 2.

There are two reasons for using the reciprocal arrangement. It is necessary to record an S.U. curve so that this curve may be used to correlate precisely the lateral and normal curves so that, as mentioned before, both current conductors must be in the hole. Second, it is convenient to continue to record the S.P. between M and N so that it is necessary to have electrode N grounded at the surface. If both M and N are in the hole, only an S.P. gradient will be recorded.

At the present time, Schlumberger uses a six-conductor cable which enables recording a lateral curve simultaneously with two normal curves and an S.P. curve. Fig. 1, however, is easier to follow than that of the six-electrode arrangement.

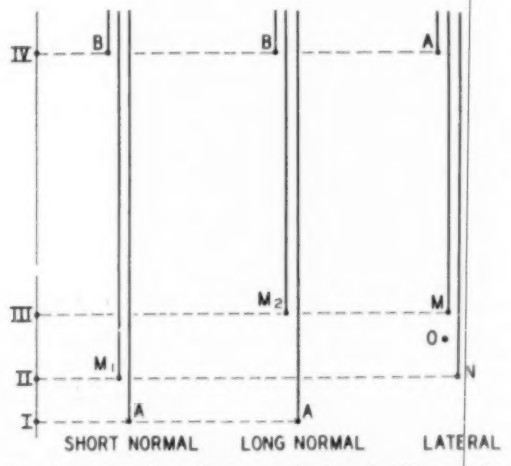


Fig. 1—A four-electrode system, I through IV, and the arrangements which are possible with it. (Schlumberger Well Surveying Corp. Document 4.)

Author is assistant professor of petroleum engineering, Missouri School of Mines and Metallurgy.

Applying Lube-Oil Additives—1

by W. D. Thomas

ADDITIVES were first used in the early thirties on a commercial basis. During the past 20 years various types were developed and may be classified as follows: (1) Pour depressants, (2) viscosity-index improvers, (3) antioxidants, (4) bearing corrosion inhibitors, (5) detergents, (6) antifoam agents, (7) rust preventives.

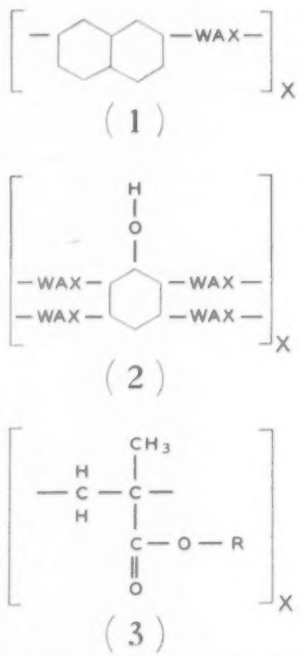
Pour-point depressants . . . These may be considered as the first commercial lubricating-oil additives. They appeared in the early thirties. The use of pour depressants eliminated the necessity for drastic dewaxing which is costly. Dewaxing to the range of about 0° F. to 15° F. followed by the addition of a pour depressant is generally the most economical means of producing low-pour oils. Pour depressants are applied in winter-grade motor oils. Lubricants with pour points of —35° F. are common in northern states. They are also used in automatic transmission fluids where good flow properties are required for cold-weather operation.

Numerous types of chemical compounds have been patented for the purpose of depressing the pour point of base stocks. Three common and widely used pour depressants are shown in Fig. 1.

When a paraffinic oil is cooled the wax crystallizes in needle-like form and finally attains a sponge-like mass which prevents the body of oil to flow. A suggested mode of action of pour depressants is that the agent coats the small crystals of wax as they first start to grow and forms a protective film. The coating separates the small particles and prevents the formation of a sponge. They do not prevent crystallization but produce a slurry of fine particles which can flow.

Under certain storage conditions, usually where the temperature fluctuates in a range above the pour point, it is frequently observed that the pour point increases. This is known as pour reversion. One theory advanced for this phenomenon holds that on warming above the pour point the depressant dissolves in the oil, and then on cooling the wax crystal grows before the depressant can form its protective film.

Viscosity-index improvers . . . These were developed to improve the viscosity-temperature relation of oils above that obtained by refining methods. For example, in producing a lubricating stock to a given viscosity index it might be more economical to refine part way to the viscosity index desired and add an improver for the balance. This is true if a high loss in yield occurs when the stock is refined the whole distance.



POUR POINT DEPRESSANTS—No. 1 is a complex condensation product of paraffin wax and naphthalene. The paraffin wax is chlorinated and condensed with naphthalene by the Friedel-Crafts reaction. No. 2 is similar; however, phenol is used as the nucleus in place of naphthalene. No. 3 is a polymer of methacrylate ester. Fig. 1.

Viscosity-index improvers are applied in crankcase oils and automatic-transmission fluids. The present trend is toward higher viscosity index and a number of oils on the market are over 100. A recently announced new motor oil has a viscosity index of 150. One equipment manufacturer specifies its transmission fluid to have a viscosity index of 135.

In general viscosity-index improvers are high-molecular compounds. Some of the types in common use are: (1) Polymerized butene, (2) Polymers of methacrylate esters, (3) Polmers of alkyl styrenes.

The viscosity-temperature characteristics of an oil are modified by the presence of the polymers because of a change in the physical state of solution or dispersion. There are considerable data to support the theory that at the lower temperature a dispersion of the high-molecular-weight polymers exists and their intrinsic viscosity is lower. Passing through the temperature range (100°-210° F.) solution of the long chain macro-molecules occurs with resulting higher viscosity of the oil.

Pour depressants and viscosity-index improvers control physical properties of the oil. Control of chemical properties of the oil started with the use of antioxidants. As stated above, improved lubricants had to be developed to keep pace with engine design and service conditions. Compression ratios were increased to improve efficiencies. With increased compression ratios higher temperatures and pressures were encountered. As engine design advanced problems of deposits of sludge and varnish arising from the oxidation of the oil necessitated a search for additives to stabilize the hydrocarbon system and retard its deterioration in service. The oil mist in the crankcase, subjected to high temperatures and to oxidizing blowby gases, deteriorates to form resinous and insoluble products which tend to build up on engine parts.

Author is with American Cyanamid Co. From paper presented at W.P.R.A. meeting.

Part 5 of 7 Parts

Underground Corrosion

New Techniques in Control

by O. C. Mudd

THE previous four parts to this series have appeared at intervals since November 30, 1953, when the first installment was presented.

The author believes that better pipe-line coatings are needed. He presented a number of thoughts on that subject in Part 4 (issue of December 28) and continues on this subject here.

Better coatings needed . . . The curves in Fig. 11 summarize the results of 10 tests made using various types of coatings (see previous installment for details of these tests). The curves were obtained over a period of 1,600 hours, but eventual trends were established after only 150 hours.

These tests were conducted with ¼-in. flat-end rods contacting the coating and loaded to exert 10 psi.

Resiliency needed . . . Resilience, in some degree, is a most desirable characteristic for pipe-line coatings. Rubber is resilient in that it has the property of storing energy within its structure when deformed by applied pressure and of returning to or near the original state when the pressure is removed. This property is desirable in pipe coatings because new lines laid in a trench often have pressure points from objects that soften or give way when the soil and backfill become moist or saturated.

Moisture absorption by coating materials is not a proper index of effectiveness but the moisture transmission rate through a thickness equivalent to that normally applied to a pipe surface is more indicative.

These tests illustrating coating performance are basically a moisture-penetration test of a material as it is to be used in service. Coating failure is manifested by the first indication of current flow from the test coupon which occurs when moisture penetrates to the magnesium surface. No metal surface damage by corrosion occurs until moisture penetrates through the coating.

Some materials show a high moisture-absorption rate under accepted standard tests but allow very little moisture passage through an applied coat only a fraction of an inch in thickness; others show low absorption rates yet allow relatively high rates of moisture transmission. A low moisture-transmission rate through the thickness to be used is a requisite for good pipe-coating material.

Bonding qualities . . . Good bonding qualities of a coating are essential in retaining the material in place during subsequent handling and after burial. Effective bond also prevents accelerated moisture penetration by osmosis into voids occurring through lack of bond when applied or loss of bond later.

Moisture or water collecting in voids under unbonded coating can cause corrosion and such attack may go undetected until pipe-wall penetrations occur. If the coating over these voids containing water is intact or has only minor holidays cathodic protection will not be effective because a protective current density cannot be established at the metal surface.

Immunity of a coating material to fracture by thermal or mechanical shock is an important feature. It would be most desirable to have materials of such composition that they would withstand extremely cold weather or tropic heat without essential changes in physical properties.

Many of our present-day coatings that are satisfactory in hot weather are too brittle and subject to checking during low-temperature periods, or too soft in hot weather if suitable for cold spells.

Large-diameter lines of high yield strength steel operated at high unit stress have introduced new problems. The circumferential elongation of the pipe from zero to maximum pressure is proportionately greater than with earlier types steel used in pipe lines.

If pressure changes are sudden and over wide enough range particularly during cold weather some types of coatings will check as the metal elongates with line pressure increases and disbond as the metal retracts with pressure drop.

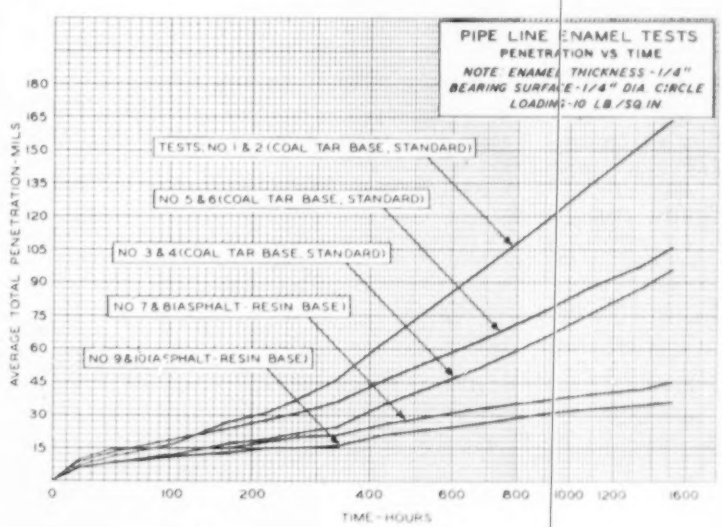


Fig. 11

Author is senior corrosion engineer, Shell Pipe Line Corp., Houston. Paper presented before session on transportation, annual A. P. I. meeting, Chicago, November 10, 1953.

EQUIPMENT MEN . . . in the News

Shannon Named to New Position By Walter Kidde

G. T. SHANNON

Gerald T. Shannon has been appointed managing engineer for the industrial engineering department of Walter Kidde Constructors, Inc., engineers and builders of New York and Houston, it has been announced by William Collins, president.

Shannon was previously assistant director, engineering and construction division, U. S. Atomic Energy Commission, New York operations office, where he was active in the expansion of AEC processing facilities. He has had extensive and varied experience in plant design, construction, and operation, both in this country and abroad.

Shannon will supervise expanded activities of the industrial-engineering department at Walter Kidde, and will report directly to A. Kingsley Ferguson, vice president in charge of the department.

Marshall Visits Latin America For H. C. Smith Oil Tool

Arthur S. Marshall, general sales manager of H. C. Smith Oil Tool Co., left this week by plane for South America on a 6-week business trip in the interest of his company. Marshall will tour the various oil fields in Venezuela, Peru, Bolivia, Chile, Brazil, and Equador. Upon return, he will visit his company's distributor in Mexico City.

Brown Fintube Licenses Friedrich Uhde GMBH

Brown Fintube Co., Elyria, Ohio, originators of Brown resistance welded integrally bonded Fintubes, and manufacturers of Brown Fintube sectional heat exchangers, tank heaters, line heaters, tank suction heaters, air heaters, and other Fintube heat transfer products, has licensed Friedrich Uhde GMBH, 21b Dortmund, West Germany, to manufacture and sell the company's products in West Germany and other countries in Europe, Africa, and the Middle East.

Dresser Manufacturing Appoints Vance to Area

Thomas L. Vance was recently appointed sales representative for southern California, Nevada, and Arizona by Dresser Manufacturing division, of Bradford, Pa. His headquarters will be in Los Angeles. A 1950 graduate of Texas Christian University, Vance was formerly employed by South Chester Tube Co., Fort Worth. He joined Dresser in September 1953.

A. O. Smith Meter Division Makes Sales Staff Changes

The following organizational changes in the Meter division of A. O. Smith Corp. have been announced by W. G. Moser, manager.

C. P. Hammill, formerly customer order service supervisor, Los Angeles, has been made administrative assistant to the division manager.

William T. Schultze, formerly salesman in the Chicago office, has been transferred to the New York office, where he will supervise dealers in New England and Mid-Atlantic areas.

Paul W. Myers, formerly of Smith-Ohio Liquid Meter Co., has been appointed company salesman at Cleveland. Kenneth R. Zink has been employed as company salesman in the Houston office.

National Replaces Stores in Gulf Coast Areas

New, modern store buildings have been opened by National Supply Co. in three locations in its Gulf Coast division, replacing older stores in the same communities.

At Natchez, Miss., the new structure, in the southeastern part of town, replaces a store first opened in 1943. It will serve western Mississippi and northeastern Louisiana, covering approximately 31 counties. R. D. Colter, Jr., is store manager and Ned Young is district manager.

The new building at Houma, La., is more than double the size of the older structure, occupied since 1944, which has been moved from the lot. It serves nine parishes of Louisiana. J. L. Voss is store manager. L. A. J. Monroe is district manager and F. H. Whiteside is assistant district manager.

The new store at Alice, Tex., replaces a building occupied since 1950. Located west of the city, it will serve eight counties. J. V. Hall is store manager. V. H. Gardner is district manager and R. A. Turney is assistant district manager.

The Natchez building consists of a 50-by-100-ft. corrugated-iron structure with 25-by-20-ft. glass display front. Those at Houma and Alice include 32-by-45-ft. brick display fronts, in addition to the 50-by-100-ft. warehouse section. All of the stores are air conditioned.

John W. Babb is division manager of the Gulf Coast division.

National's new store at Natchez.

National Research to Build Petrochemical Laboratory

Richard S. Morse, president of National Research Corp., has announced the beginning of construction of a new petrochemical laboratory on the company's property at Newton, Mass., part of the Cabot, Cabot & Forbes industrial real-estate development.

The new building, located near the company's equipment division plant, will accommodate the recently expanded operations of the petrochemicals research department. National Research has for several years been engaged in a joint venture with Electric Bond & Share Co. and United Gas Corp. conducting research and market studies aimed at producing new chemicals employing natural gas as a raw material. Construction of the building is scheduled for completion in mid-February 1954.

J.&L. Supply Announces Two Recent Promotions

Robert J. Woods, Jr., director of sales, Jones & Laughlin Supply Division, Tulsa, has announced two recent promotions in J. & L. Products sales department at the division's Houston sales office.

G. A. PRYOR

G. E. TYSON

George A. Pryor, salesman, J. & L. Products, was promoted to assistant sales manager, J. & L. Products, and has assumed supervision of the sale of J. & L. tubular products and wire rope in the Gulf Coast area and in Southeast Texas.

George E. Tyson, salesman, J. & L. Products, has been promoted to the newly created position of sales engineer, J. & L. Products. In this capacity Tyson will concentrate on the sales application of J. & L. tubular products and wire rope, and will also work with the technical departments of customers in the development of new products.

Pryor joined Jones & Laughin Steel Corp. in 1939, following graduation from Kenyon College. A year later he was selected as one of 10 college graduates for the general office student training group, and in 1941, was transferred to the tube sales department. He was transferred to Fort Worth in 1946, and in 1952, he was transferred to Houston as salesman.

Tyson entered the employ of Jones & Laughiin Steel Corp. as a salesman at Houston in 1938, and in 1944 was transferred to the supply division at Houston as salesman.

Schlumberger Holds Electric Logging Conference in Houston

A conference on electrical-log interpretation was presented November 16-20 by Schlumberger Well Surveying Corp. in the lecture room at its new Houston plant. Pictured are representatives of oil companies who attended the conference. A number of Schlumberger's own engineers also attended. In this picture are, front row: R. E. Lowry, Humble Oil & Refining Co., Houston; G. B. Brown, Tennessee Production Co., Houston; E. Sugar, Creole Petroleum Corp., Jusepin, Venezuela; C. V. Wilson, Colorado Interstate Gas Co., Colorado Springs; F. W. Brupbacher, Sun Oil Co., Beaumont, Tex.; C. D. Smith, Union Producing Co., Jackson, Miss.; R. W. Allen, El Paso Natural Gas Co., Farmington, N. M.; and F. S. Daniel, Humble Oil & Refining Co., Wichita Falls.

Middle row: J. B. Terry, Richardson & Bass, Fort Worth; Ray George, Phillips Petroleum Co., Bartlesville, Okla.; J. D. Owen, Phillips Petroleum Co., Bartlesville; K. R. Stout, Trafford & Associates, Calgary, Alta., Canada; R. L. Porter, Sinclair Oil & Gas Co., Houston; L. G. Huntley, Carter Oil Co., Mattoon, Ill.; C. R. Hoagland, K. A. Ellison Consultants, Oklahoma City; K. W. Roth, Amerada Petroleum Corp., Williston, N. D.; E. E. Tucker, Tide Water Associated Oil Co., Midland, Tex.; W. J. Bates, J. M. Huber Corp., Borger, Tex.; and J. D. Tuohy, International Petroleum, Ltd., Bogota, Colombia.

Top row: R. D. Ottmann, Humble Oil & Refining Co., Tyler, Tex.; K. E. Merren, McAlester Fuel Co., Magnolia, Ark.; G. C. Borland, N. Y. State Natural Gas Co., Pittsburgh; E. Clements, Richardson & Bass, New Orleans; C. M. Muil, Humble Oil & Refining Co., Corpus Christi; T. Walker, Atlantic Refining Co., Dallas; B. Barron, Humble Oil & Refining Co., Paradis, La.; J. E. Carothers, Phillips Petroleum Co., Houston; W. W. McMahan, Jr., Magnolia Petroleum Co., Houston; and T. Wilson, Jr., Ohio Oil Co., Bakersfield, Calif.

Not in the picture were: Guy Joyce, Union Sulphur Co., Lake Charles, La.; and Ed Mulanovich, International Petroleum, Ltd., Coral Gables, Fla.

Oil Metering Names Bob White to South Texas Area

Appointment of Bob White, Houston, as representative in the South Texas area has been announced by Oil Metering & Processing Equipment Corp., of Houston.

Oil Metering manufactures well testers, test separators, metering separators, free water knockouts, gas scrubbers, and oil and gas separators. White's territory will include the lower Gulf Coast area from the south side of Fort Bend County to Brownsville.

American Iron Promotes Gardenhire to New Post

Odus Gardenhire has recently been promoted to the position of regional sales coordinator for American Iron & Machine Works Co.

Gardenhire has had wide experience in the oil fields, having started with American Iron in 1928 as a field representative in the East Texas area. He represented American Iron in Corpus Christi, Houston, Monahans, Kilgore, Conroe, Harvey, and New Iberia, before being made district manager of the Oklahoma City area in 1942. From Oklahoma City, Gardenhire was transferred to Midland as West Texas district manager, which position he has held until his recent promotion.

In his capacity as regional sales coordinator, he will work as coordinator between divisions specializing on special accounts in North and West Texas, New Mexico, and Colorado.

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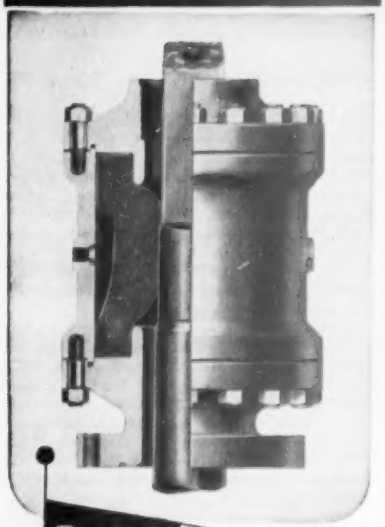

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Pipe-Line Patrol

. . . Report on Construction

Equipment Controlled by Winches in Hills

IN rough country of Kentucky, coating and wrapping equipment was held back by winch line as it moved down steep slopes, where H. C. Price Co. has been engaged in the laying of a section of the 845-mile, 30-in. trunk line from Louisiana to Kentucky for Gulf Interstate Gas Co.

An article on Gulf Interstate Gas Co.'s unique organization and engineering practices will appear in an early issue of The Oil and Gas Journal.

Under Way, Contracted, and Planned . . .

PIPE-LINE activity as reported below by The Oil and Gas Journal is compiled from information received from pipe-line companies and contracting firms.

These projects include those planned, proposed, under way, and contracted. Uncontracted projects are indicated by a • preceding the company name.

Crude-Oil Pipe Lines

• **California - Oregon Pipe Line System**—103 miles 6-in., proposed, Crescent City, Calif., to Medford, Ore.

• **Cities Service Pipe Line Co.**—60 miles, 12-in., begin March 1954, Houston to Sour Lake, Tex.

Gulf Refining Co.—55 miles, 12-in., completed. Bay Marchand to Plaquemines, La.

Gulf Refining Co.—63 miles, 8-10-in., under way, Lea County, New Mexico, to Anderson and Denton fields. 1-54.

Magnolia Pipe Line Co.—29 miles 8-in., completed, Midland County, Texas, area. Bishop & Lock Const. Co.

Magnolia Pipe Line Co.—56 miles, 8-in., contracted, Seminole, Tex., to Gladiola Junction, N. M. Completion date 2-54.

• **Michi, Inc.**—10-in., planned, Highland, Ind. to Kalamazoo, Alma, and Elsie, Mich.

• **Pasotex Pipe Line Co.**—146 miles, 10-in., planned. Snyder to Wink, Tex. 2-1-54.

Phillips Pipe Line Co.—18 miles, under way, gathering lines, northeast area of Andrews County, Texas.

• **Progress Pacific Pipeline Co.**—1,100 miles, 24-in., planned, Odessa, Tex., to Los Angeles, Harbor, Calif.

• **Roosevelt Oil & Refining Corp.**—22 miles, 4 and 6-in., planned St. Helen to Norwich, Mich.

• **Sinclair Pipe Line Co.**—20 miles, 12-16-in., planned, Monee to Blue Island, Ill. Completion date 4-54.

Texas New Mexico Pipe Line Co.—52 miles, 10-in., under way, Dawson County to Basin System. McVean & Barlow.

Texas Pipe Line Co.—34 miles, 6-in., under way, Sour Lake to Port Arthur, Tex. Houston Contracting.

45 miles, 8-10-in., under way, between Erath and Bayou Sale stations. Houston Contracting Co.

65 miles, 4-6-8-12-in., under way, South Louisiana. Panama-Williams.

Golden Meadow to Houma, La. Panama-Williams.

Gathering lines in Leeville, Bay De Chene and Golden Meadow pools. Panama-Williams.

• **West Coast Pipeline Co.**—960 miles, 20-22-in., planned. Wink, Tex., to Norwalk, Calif.

Products Pipe Lines

Augusta Pipe Line Co.—43 miles, 8-in.,

completed, from Arkansas City to Augusta, Kans. Ray L. Smith & Son, Inc.

Badger Pipe Line Co.—215 miles, 8-10-12-in., begin Spring '54, East Chicago, Ind., to Madison, Wis. (Joint project of Cities Service Oil Co., Sinclair Pipe Line Co., Pure Oil Co., and The Texas Co.)

• **H. W. Bass & Sons, Inc.**—152 miles, 4-6-in., proposed. Duval and Live Oak counties, Texas, to Corpus Christi, Tex.

Frontier Ref. Co.—6-in., planned, Cheyenne, Wyo., to North Platte, Neb.

• **Great Lakes Pipe Line Co.**—Proposed, extension 130 miles, Nebraska City to Grand Island, Neb.

Harbor Products Systems—86 miles, 16-in., under way, Woodbury Junction, Philadelphia to Trembley Point, N. J. Construction Service Co. and H. C. Price Co. (Joint ownership of Sinclair Pipe Line Co., Gulf Refining Co., and Texas Pipe Line Co.) Completion date 1-54.

• **International Pipe Line, Inc.**—132 miles, 8-in., proposed, Wrenshall to Minneapolis, Minn.

Oklahoma Mississippi River Products Line, Inc.—475 miles, 12-in., under way, Duncan, Okla., to West Memphis, Ark. Ford, Bacon & Davis Const. Corp.

Under way, White River to Allen, Okla. River Const. Co. Completion date 6-30-54.

Under way, Allen to Duncan, Okla. River Constr. Corp. Completion date 6-30-54.

• **Phillips Petroleum Co.**—54 miles, 6-in., planned, Goldsmith to Borger, Tex.

52 miles, 10-in., planned, Shell's Brookshire system to Sweeny, Tex.

• **Triangle Pipe Line Co.**—560 miles, proposed, Arkansas City, Ark., to Covington, Ky., and Nashville, Tenn.

U. S. Gov't. Alaskan Products Pipe Line.—600 miles, 8-in., under way, Haines northward through British Columbia and Yukon to Fairbanks, Alaska. Williams Bros., McLaughlin, Inc., and Marwell Const. Co. Completion date 9-55.

• **United States Pipe Line Co.**—1,799 miles, 22-26-in., proposed, Beaumont, Tex., to Newark, N. J.

Beaumont, Tex., to Memphis, Tenn.

Memphis, Tenn., to Louisville, Ky.

Louisville, Ky., to Newark, N. J.

Laterals to Paducah and Lexington, Ky.

Williston Basin Pipe Line Co.—250 miles, 8-in., under way, Laurel-Billings, Mont., refineries to Glendive, Mont.

Wolverine Pipe Line System—200 miles, 14-in., under way, Chicago-Toledo-Detroit. (Joint ownership of Shell, Texas, and Cities Service.) Anderson Bros. and Midwestern Constructors, Inc. Completion date 1-54.

East Chicago, Ind., to Kalamazoo River. Midwestern Constructors, Inc.

Yellowstone Pipe Line Co.—(Continental Oil Co., Interstate Oil Pipe Line Co., Union Oil Co., and H. Earl Clack interest) 540 miles, 10-in., contracted, Billings, Mont., to Spokane, Wash. 9-54.

Billings to Bozeman, Mont. Ross and Powers.

Bozeman to Helena and on to Clinton, Mont. Associated Pipe Line Contractors, Inc.

Clinton to Perma, Mont. Associated Pipe Line Contractors, Inc.

Clinton to Perma, Mont. Eastern Pipe Line Fields Service Co.

Perma, Mont., to Murray, Idaho. Eastern Pipe Line Field Service Co.

Murray, Idaho to Spokane, Wash. Engrs. Limited Pipe Line Co.

Natural-Gas Pipe Lines

• **America-Louisiana Pipe Line Co.**—1,000 miles, 30-in., proposed, Lowry, La., to Detroit, Mich.

Arkansas-Louisiana Gas Co.—107 miles, 8-24-in., proposed, Arkansas, Louisiana, and Texas.

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in the right place
at the right time!

No. 5166-GS-B

Snap-on*

MECHANICS STANDARD SERVICE SET

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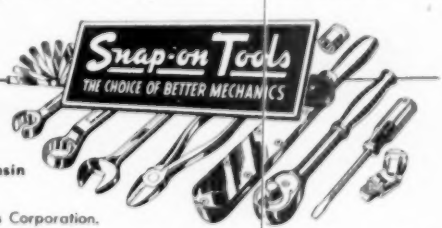

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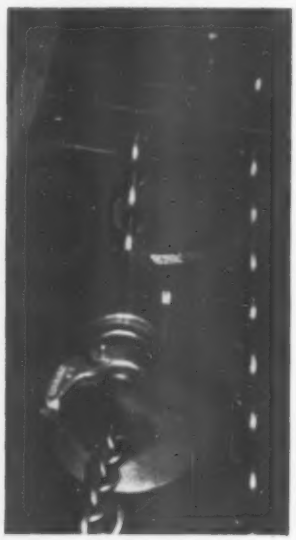

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At last a 100% safe hook for every type of equipment; utility and chain hoists, horizontal tuggers, come-a-longs, cranes, block and tackle or snatch blocks. Safety gate automatically locks closed and cannot be disengaged accidentally. A touch of the finger releases the lock to open gate. If the hook is sprung, even ¼ inch, gate will swing free, warning workers. All hooks used are standard drop forged hooks with B & B safety gates of non-corrosive brass. Sizes available #2 through #16A. Return spring on gate is available at additional cost. Write for descriptive circular.

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SAFETY HOOK DIVISION
275 EIGHTH STREET
SAN FRANCISCO 3, CALIF.

With gate open hook's throat is entirely free

EVERYTHING BULLARD IN SAFETY

T. M. REG. U. S. PAT. OFF.

• **Arkansas-Missouri Power Co.** — 140 miles, 2 to 10-in., planned, St. Francis River, Clay County, Arkansas, to near Campbell, Mo.

• **Associated Natural Gas Co.**—88 miles, proposed, Missouri.

• **Atlantic Seaboard and Virginia Gas** Transmission.—116 miles, 26-in., proposed, loops along Cobb, W. Va., to near Baltimore, Md.

Buzzards Bay Gas Co.—28 miles, 8-in., under way, Hyannis, Mass., to Bourne Bridge, Mass. Hallen Co., Inc. Completion date 2-54.

• **Carolina Natural Gas Corp.**—185 miles, 2-12-in., proposed, lateral lines off Transcontinental in North and South Carolina.

• **Chicago District Pipe Line Co.**—31 miles, 24-30-in., proposed, East bank of Des Plaines River southwesterly to near Hodgkins, Ill., on through Cook County to Will County, Illinois.

• **Cities Service Gas Co.**—18 miles, 16-in., Lawrence and Newton counties, Missouri.

69 miles, 20-16-in., planned, Cleveland, McClain, and Garvin counties, Oklahoma.

• **City of Fayette, Ala.**—20 miles, 5-in., proposed, Fayette, Ala., to Southern Natural's system in Tuscaloosa County, Ala.

City of Dallas, Ga.—8 and 4½-in., distribution system. Engineering & Const. Co 1954.

• **Coast Counties Gas & Electric Co.**—40 miles, 3, 4, and 8-in., planned. Coast and Valley region, California.

• **Colorado Interstate Gas Co.**—365 miles, 22-in., proposed, Green River, Wyo., to Denver, Colo. 1954.

49 miles, 20-in., proposed, Morton County, Kansas, to near Hooker, Okla.

Colorado Interstate Gas Co.—70 miles, 20-4-in., under way, gas-gathering system in Kansas. Engineering & Const. Co. 1-1-54.

243 miles, 4 to 20-in., under way, Colorado, Oklahoma, Texas, and Kansas. Engineering Const. and Z. J. Graham.

• **Cumberland and Allegheny Gas Co.**—31 miles, 12-in., proposed, Garrett County, Md., to Keyser, W. Va.

East Tennessee Natural Gas Co.—96 miles, 16-in., under way, Knoxville, Tenn., to Kent line. Engineering & Const. Co. 1-1-54.

54 miles, 4-12-in., under way, laterals off main line from Knoxville, Tenn., to Kent line. Engineering & Const. Co. 1-1-54.

• **El Paso Natural Gas Co.**—1,178 miles, proposed, Permian basin, New Mexico, Texas and Colorado.

El Paso Natural Gas Co.—771 miles, 30-in., under way, Plains, Tex., to Kingman, Ariz.

Section 1—Under way, Plains, Tex., to Corona, N. M. Oklahoma Const. Co.

Section 2—Under way, Corona to Suwanee, N. M. R. H. Fulton.

Section 3—Under way, Suwanee to Gallup, N. M. R. H. Fulton.

Section 4-5—Under way, edge to Navajo Reservation east to Flagstaff on to Kingman, Ariz. Western Pipe Line Const., Inc. Completion date 2-54.

Under way, across Navajo Reservation connecting sections 3, 4, and 5. El Paso Co. crews.

Under way, Spraberry fields, El Paso Co. crews.

• **Fort Worth Basin Gas Co.**—Planned, Novice, through Brown and Comanche counties, Texas.

• **Glacier Gas Co.**—285 miles, 20-in., proposed, Kalispell, Mont., to Spokane, Wash.

120 miles, 16-in., proposed, Spokane to Hanford, Wash.

91 miles, 8⅝-in., proposed, Spokane to Lewiston, Idaho.

130 miles, 12¾-in., proposed, Spokane to International boundary at Trail, British Columbia.

Gulf Interstate Gas Co.—860 miles, 30-in., under way. Acadia Parish, La., to Boyd

County, Ky. H. C. Price and Houston Contracting. 11-54.

Under way, Rayne, La., to Kincade, Tenn. Houston Contr. Completion date Spring 1954.

Under way, Gordonsburg, Tenn., to Cattlettsburg, Ky. H. C. Price Co.

230 miles, gathering lines, under way. Associated Pipe Line Contractors, Anderson Bros., Williams Bros.

329 miles, 12 to 24-in., proposed. Laterals off Acadia Parish, Louisiana, to Boyd County, Kentucky, line.

● **Home Gas Co.**—32 miles, 12-in., planned, Breesport to Union Center, N. Y.

17 miles, 12-in., proposed, loops from Hansock to Sanford, N. M.

● **Interstate Power Co.**—26 miles, 8-in., proposed, from Nat. Gas P. L. Co. America line near Hooppole, Ill., to Clinton, Iowa.

● **Lone Star Gas Co.**—100 miles, proposed, storage fields to the Dallas-Fort Worth area.

35 miles, 12-in., proposed, southeastern Schleicher County.

Lone Star Gas Co.—44 miles, 12-in., under way, Red Springs, Woods County to Sulphur Springs area, Hopkins County, Texas.

● **Manufacturers Gas Light & Heat Co.**—40 miles, proposed, Allegheny, Washington, and Beaver counties, Pennsylvania.

213 miles, 3 to 26-in., proposed, various points on system in Pennsylvania, West Virginia, and Ohio.

72 miles, 16-20-in., proposed, Doddridge, Wetzel and Marshall counties, West Virginia.

● **Mississippi River Fuel Corp.**—109 miles, 10-18-in., planned, laterals in Woodlawn and Waskom gas fields, Texas.

Missouri Central Gas Co.—25 miles, 6-in., contracted, Moberly to Macon, Mo. L. R. Young Const. Co.

● **Missouri Public Service Co.**—136 miles, 8-10-in., proposed, New Franklin to Trenton, Mo.

24 miles, 10-in., Johnson County to Clinton, Mo.

● **Montana Power Co.**—52 miles, 16-in., planned, Canada - Montana border to Cut Bank, Mont.

● **Natural Gas Producer, Inc.**—100 miles, 12-in., planned, Yenter pool to Denver, Colo.

Nevada Natural Gas Pipe Line Co.—114 miles, 10¾-in., under way, Topock, Ariz., to Las Vegas, Nev. R. H. Fulton. Completion date 1-1-54.

● **New River Gas Co.**—50 miles, planned, Summers to Monroe counties, West Virginia, to Narrows and Dublin, W. Va.

Northeastern Gas Transmission Co.—22 miles, 8-in., completed 12-21-53. Upton, Mass., to Pawtucket, R. I. Associated P. L. Const., Inc.

● **Northern Indiana Fuel & Light Co.**—35 miles, 8-in., planned, Edgerton to Auburn, Ind.

● **Northern Natural Gas Co.**—458 miles, proposed, Kansas, Texas, Oklahoma, and Nebraska, Iowa, and Minnesota to connect with Permian Basin System.

475 miles, proposed branch lines to Iowa, Nebraska, Minnesota and South Dakota.

● **Northwest Alabama Gas District**—40 miles, 9-in., proposed, Southern Natural's line through Windfield to Haleyville, Ala.

● **Northwest Natural Gas Co.**—750 miles, planned, Washington, Oregon, and Idaho.

24-in., Eastport, Idaho, to Monroe, Wash.

18-in., Monroe to International boundary near Lynden, Wash.

22-in., Monroe to near Seattle, Wash.

20-in., Seattle to Portland, Ore.

● **Ohio Fuel Gas Co.**—31 miles, 20-in., planned, Licking County to Richland County, Ohio.

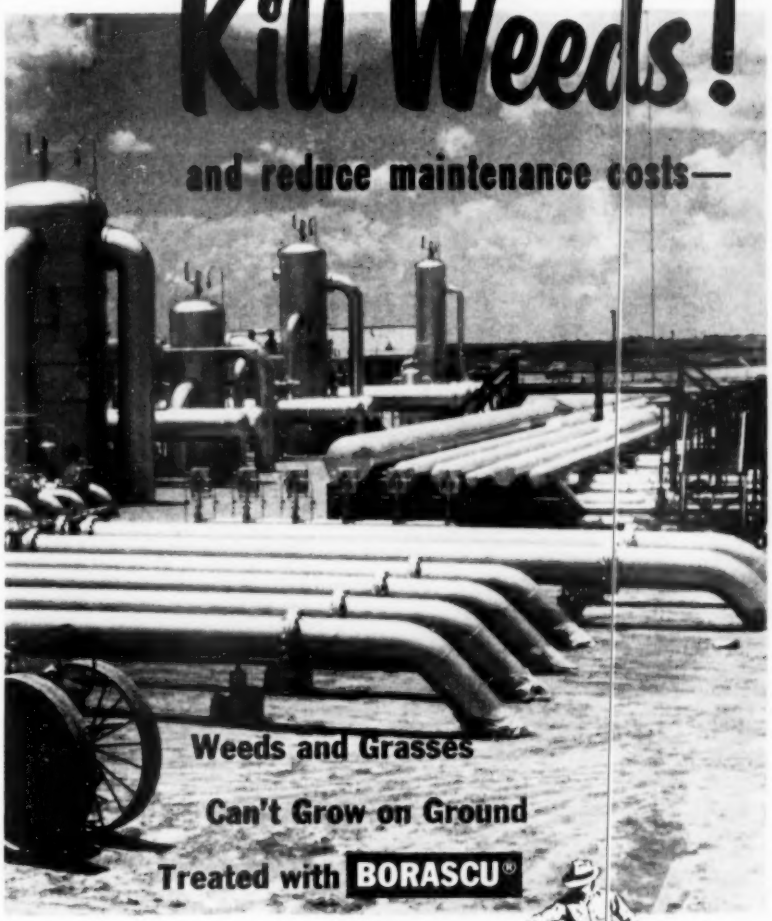
22 miles, 16-in., planned, Dayton, Troy, Piqua, and Sidney, Ohio.

23 miles, 16-20-in., planned, Wellington to Elyria, Ohio; 16 miles, 20-in., planned, Benton Station to Crawford Station; 18 miles, 20-in., Crawford Station to near Columbus;

Here's the easy way to

Kill Weeds!

and reduce maintenance costs—



.....a single application may keep an area cleared for 1 or 2 years!

Where ground must be kept bare of all fire-hazardous weeds and grasses . . . that's the place for BORASCU! This weed killer gives long-lasting results because it goes into the soil, and remains there, where it can destroy plant life, *roots included!* Economy-minded production men like BORASCU; figure it saves up to 80% of former "grassing" costs . . . and it's safe, nonflammable, easy to use. Write for literature.

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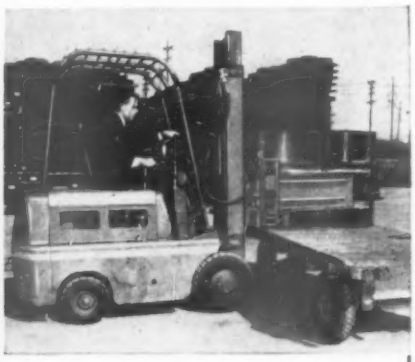
DISTRIBUTORS LOCATED THROUGHOUT OIL FIELDS OF U.S.A., CANADA, MEXICO, COLOMBIA, VENEZUELA.

How to Convert a Drum-Handling Problem into CASH ON THE DRUM!

. . . Here are five proved ways in which Clark trucks and special drum-handling devices can change a problem into a profit

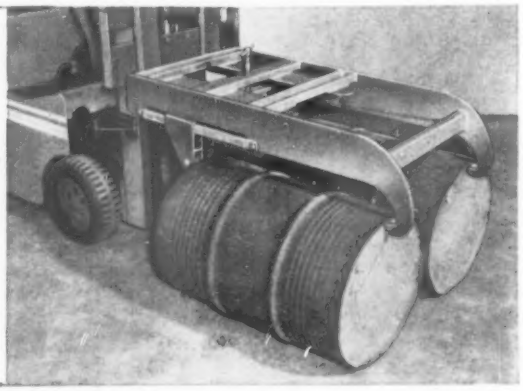
1. LIFT-O-MATIC...
handles *any* drum, metal or fiber, without use of pallets



2. CLAMP-LIFT... two types; two drums at a time or singly—in tandem or side-by-side; no pallets—fast, safe

3. DRUMS on PALLETS...
easy for standard forks; unit load of one, two or four drums—vertical position or horizontal

4. KUGHLER DRUM HANDLER...
picks 'em up where they are—puts 'em down where you want them



. . . To cut handling time and storage costs, talk to your Clark dealer about the drum-handling equipment best suited to your needs. He's listed in the Yellow Pages of your phone book.

CLARK EQUIPMENT

Industrial Truck Division
CLARK EQUIPMENT COMPANY
Battle Creek 158, Michigan

16 miles, 16-in., planned, Berlin to Sandusky, Ohio.

74 miles, 3 to 20-in., planned, Hocking, Knox, and Ashland counties, Ohio.

47 miles, 20-in., planned, Benton Township, Hocking County, to Columbus, Ohio.

61 miles, planned, northern and southwestern Ohio.

33 miles, 20-in., proposed, Jefferson to Seneca, Ohio.

69 miles, 20-24-in., proposed, lines to tiein Gulf Interstate line along various points in Lawrence, Jackson, Vinton, Hocking and Fairfield counties, Ohio.

• **Pacific Gas & Electric Co.**—50 miles, 12-16-20-in., planned, Fresno to Merced, Calif.

(Section 2) 20-in., Holm to Topock-Milpitas line.

(Section 3) 12-in., parallel existing Madera-Livingston line, planned. Napa Wye to Shellville: Cotati to Santa Rosa, Calif.

129 miles, 31-in., proposed, main-line loops along Topock, Ariz., to Milpitas, Calif. Completion date 11-54.

Pacific Gas & Electric Co.—88 miles, 34-in., under way, portions of 34-in. Topock-Milpitas pipe line. Completion date 4-15-54.

• **Pacific Northwest Pipeline Corp.**—1,466 miles, proposed, Ignacio, Colo., to Bellingham, Wash.

380 miles, proposed, laterals and spurs off main line to Pocatello, Idaho, to Yakima, Wash.

Permian Basin Pipeline Co.—280 miles, 16-24-26-30-in., under way, West Texas and New Mexico. R. H. Fulton & Co.

• **Rockland Light & Power Co.**—22 miles, 8-in., proposed, Orangetown to Tompkins Cove, N. Y.

• **Shenandoah Gas Co.**—39 miles, 3-4-8-in., proposed, Middleton, Va., to Martinsburg, W. Va.

• **South Georgia Natural Gas Co.**—339 miles, 2-12-in., planned, Phoenix, Alta., to Tallahassee, Fla. (a) 12-in., Phoenix, Ala., to Albany, Ga., (b) 10-in., Albany, Ga., to Moultrie, Ga., (c) 8-in., Moultrie, Ga., to Tallahassee.

Southern California Gas Co., and Southern Counties Gas Co.—73 miles, 30-in., under way, loops on main line from Blythe to Los Angeles. River Const. Co. 1-54.

Southern Natural Gas Co.—1,235 miles, 24 to 4½-in., under way, Louisiana, Mississippi, Albama, and Georgia, and South Carolina. Houston Contracting, Latex and H. C. Price. Fall 1953.

Gwinville to Pickens. Completion in 1954.

Gwinville, Miss., to Ellerslie, Ga. Completion in 1954.

• **Southwest Gas Corp., Ltd.**—26 miles, proposed, from P.G.&E. line to Victorville, Calif.

• **Tennessee Gas Transmission Co.**—571 miles, 30-in., planned, Kinder, La., to Portland, Tenn.

67 miles, 30-in., planned, loops in Texas and Louisiana.

63 miles, 26-in., planned, loops in Ohio and Pennsylvania.

58 miles, 20-in., planned, Louisiana Gulf Coast to Station No. 507 near Kinder, La.

100 miles, laterals in Texas.

45 miles, 20-in., proposed, Buffalo, N. Y., to the U.S.-Canadian border near St. Catherines.

243 miles 24-in., planned, Coudersport, Pa., eastward across Pennsylvania, New Jersey, and New York to point near Greenwich, Conn.

• **Texas Eastern Penn-Jersey Transmission Corp.**—265 miles 24-in., planned, from Oakford Storage field in western Pennsylvania to Texas Eastern Transmission Corp.'s Compressor Station No. 26 near Lambertville, N. J.

• **Texas Gas Transmission Corp.**—48 miles, 26-in., planned, loops from Memphis to Slaughters, Ky.

• **Texas-Ohio Gas Co.**—1,435 miles, 30-in., proposed, Hidalgo County, Texas, through Arkansas, Mississippi, Tennessee, and Kentucky on to Spencer, W. Va.

• **Transcontinental Gas Pipe Line Corp.**—533 miles, 30-36-in., looping along Texas-New York line.

• **Trans-Northwest Gas, Inc.**—246 miles, proposed, International Boundary near Osoyoos, B. C., to Washington and Idaho.

275 miles, branch lines.

United Gas Fuel Co., and Central Kentucky Natural Gas Co.—57 miles contracted, to Putnam County, West Virginia. H. C. Price Co.

• **United Fuel Gas Co.**—50 miles, 20-24-in., proposed, Wood County to Lanham, W. Va. Spring 1954.

32 miles, 24-in., proposed, near Ripley, W. Va., to Lanham station, Putnam County, W. Va.

60 miles, 30-in., proposed, Lanham in Kanawha County, West Virginia, to Gulf Interstate line in Boyd County, Kentucky.

United Gas Pipe Line Co.—44 miles, 20-in., under way, Lirette field to Harvey, La. Brown & Root.

• **United Natural Gas Co.**—50 miles, 12-in., planned, Elk County to Jefferson County, Pennsylvania.

• **Utah Natural Gas Co.**—103 miles, 16-18-in., proposed, Clear Creek field near Price to Salt Lake City, Utah.

18-in., Clear Creek to Provo, Utah.

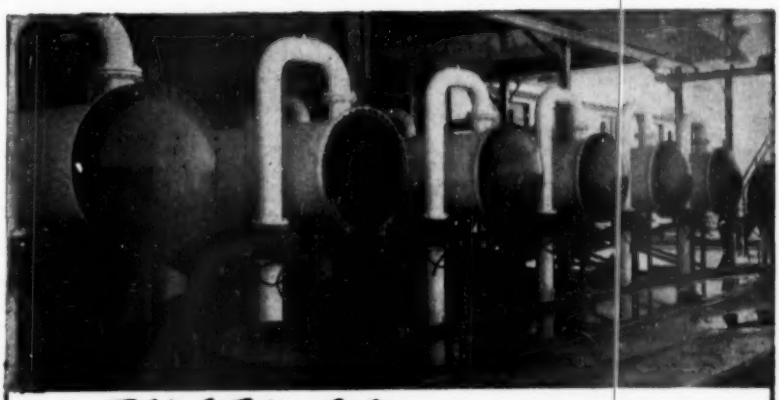
16-in., Provo to Salt Lake City, Utah.

Virginia Natural Gas Co.—153 miles, Buckingham to Richmond and Portsmouth, Va.

Warren Petroleum Co.—54 miles, 4-30-in., homa. Completion date 6-54.

Westcoast Transmission Co., Ltd.—(See foreign natural gas pipe lines).

25 miles, 3 to 20-in., Garvin County, Okla., planned, Lea County, New Mexico.



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. . . for removal of bulk quantities of water, pipe scale, and rouge from products Pipelines . . . . .

These HPQ-1000 SC Separators are in use at Plantation Pipe Line Company's Baton Rouge Pumping Station. Today, more and more Products Pipe Line Companies are using EXCEL-SO Units to remove water and dirt from products streams either as primary coalescers or as first-stage units in connection with desiccant dehydration.

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Grinding and Hard-Chrome Plating of Diesel Engine Crankshafts – All Sizes

Complete facilities for grinding, plating, Magnafluxing, and electrically-controlled heat-treating. Largest hard-chrome plating plant in Mid-Continent area.

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Experience • Quality • Precision DALLAS, TEXAS

Foreign Crude-Oil Pipe Lines

• **Arabian American Oil Co.**—18 miles, 22-20-in., planned, Qatif to Ras Tanura No. 3. Completion date 1-55.

Bombay Port Trust.—50 miles, 8 to 24-in., contracted, Bombay, India, to serve Standard Vacuum Oil Co., and Burmah Shell refineries. Merritt, Chapman & Scott Corp., contractors. (Crude and Products.)

• **Creole Petroleum Corp.**—25 miles, 34-in., planned. Lagunillas to La Salina (State of Zulia, Venezuela.) Completion date 9-54.

Direccion General de Yacimientos Petrolíferos Fiscales—409 miles, under way, Plaza Huincul to Bahia Blanca, Argentina.

• **Gaz de France**—200 miles, 12-in. Ruhr to Paris, France.

• **Interprovincial Pipe Line Co.**—600 miles 24 and 26-in. loops, planned, along Interprovincial system between Edmonton, Alta., and Superior, Wis.

• **Petroleos Mexicanos.**—145 miles, 12-in., considered, 18 de Marzo field via Reynosa to Monterrey, Mexico.

100 miles, planned, Ishthmus of Tehuantepec, Jose Colomo to El Plan field, Minatitlan.

72 miles, 12-in., proposed, Poza Rica to Atzacapotzalco, Mexico.

Petroleos Mexicanos.—125 miles, 10-in., under way, Jose Colomo to El Plan, Mexico.

• **Saskatoon Pipe Line, Ltd.**—56 miles, 6-in., planned, Milden to Saskatoon, Sask.

Texas Petroleum Co. — 60 miles, 4-6-in., under way. Pta. Nino de La Dorada.

• **Trans Mountain Oil Pipe Line Co.**—30 miles, planned, Vancouver, B. C., terminal to Ferndale, Wash.

• **Yacimientos Petrolíferos Fiscales Bolivianos.**—170 miles, 4-in., planned, Bermejo to Tupiza, Bolivia.

Foreign Products Pipe Lines

Anglo-Iranian Oil Co., Ltd.—18½ miles, 16-in., under way, Little Aden to Aden. Bechtel Corp. Completion date December 1954.

18½ miles, 6-in., under way, Little Aden to Aden. Bechtel Corp. Completion date December 1954.

15 miles, 12-in., under way, Kwinana to Fremantle, M. W. Kellogg Co. Completion date February 1955.

17 miles, 6-in., Kwinana to Fremantle. M. W. Kellogg Co. Completion date February 1955.

Columbian Ministry of Petroleum — 115 miles, 4-in., under way, La Dorado to Cartago, Colombia. William Bros. Engineers.

93 miles, 8-in., under way, Cantimplora to Dorado, Colombia. William Bros. Constructors.

• **Empresa Nacional del Petroleo** — 80 miles, 6⅝-in., planned, Concon to Santiago, Chile.

• **Governments of Southern Rhodesia and Portuguese East Africa.**—200 miles, considered, Beria, Portuguese Mozambique to Umtalia, Southern Rhodesia.

North Atlantic Treaty Organization (NATO)—1,920 miles, 4-10-in., to serve military bases in Western Europe (to connect with U. S. Government's St. Nazaire-Paris-Metz line.) Contracted by Soc. Foster Wheeler Francaise.

• **Petroleos Mexicanos.**—124 miles, 6-in., planned, Lagos to Guadalajara, Mexico.

54 miles, 6-in., planned, Lagos to Aguascalientes, Mexico.

82 miles, 8-in., planned, Salamanca to Lagos, Mexico.

• **United States Government.**—375 miles, 12-in., planned, St. Nazaire to Melun and Metz, France.

Foreign Natural-Gas Pipe Lines

Azienda Generale Italiana Petroli — 90 miles, 12-in., under way, Cortemaggiore to Bologna, Italy, SNAM crews.

120 miles, 16-in., under way, Cremona Porto Mar to Ghera, Italy, Montubi, contractor.

40 miles, 12-in., under way, Ripalta-Bergamo, Italy.

Direccion General del Gas del Estado—310 miles, 8-in., under way, Plaza Huincul to Neuquen, Argentina, to the vicinity of General Conesa, Argentina.

• **Empresa Nacional del Petroleo** — 80 miles, 10-in., planned, Concon to Santiago, Chile.

• **Mid-Continent Pipelines, Ltd.** — 1,860 miles, 30-in., proposed, Alberta to Montreal, Canada. Fish Engineering Co.

• **Northwest Natural Gas Co.**—950 miles, 24-in., planned, Alberta fields to Vancouver, B. C., Seattle, Wash., and Portland, Ore.

Petroleos Mexicanos. — 205 miles, 16-in., under way, Monterrey to Torreon, Mexico.

• **Petroleos Mexicanos.**—440 miles, 20-in., planned, Brazil to Tampico to Poza Rica, Mexico.

• **Trans-Canada Pipe Lines, Ltd., (Canadian Delhi Oil Co.)**—2,247 miles, 14 to 30-in., proposed. Alberta to Toronto to Montreal.

747 miles, 8 to 24-in., gathering system in Alberta.

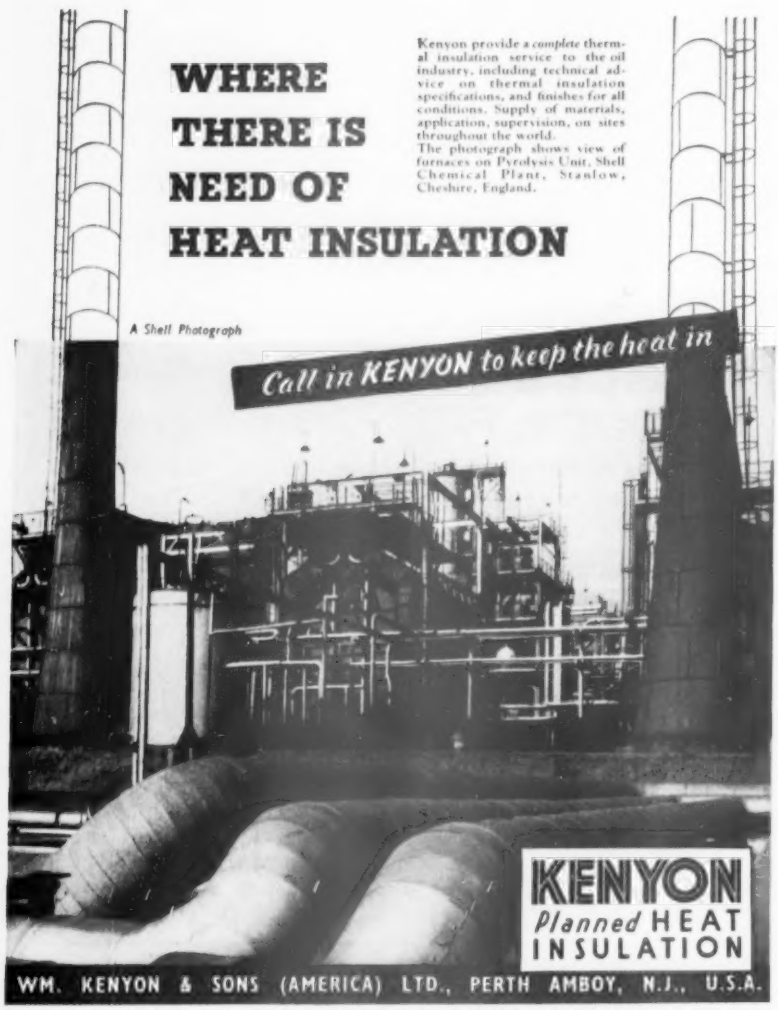
• **Westcoast Transmission Co., Ltd.**—1,110 miles, 24-in., planned, Dawson Creek, B. C., through Pine Pass and Fraser River Valley to Kamloops, Princeton, and Vancouver to Portland. Ford, Bacon & Davis, engineers.

280 miles, 20-in., planned, Pincher Creek to Montana on to Spokane, Wash. Ford, Bacon & Davis, engineers.

138 miles, 20-in., planned, Sumas to Tacoma, Wash.

139 miles, 18-in., planned, Tacoma, Wash., to Portland, Ore.

• **Western Pipe Lines.**—833 miles, 24-in., proposed, from southern Alberta, eastward across the Canadian prairies, serving principal towns and cities along the route.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Kenyon provide a complete thermal insulation service to the oil industry, including technical advice on thermal insulation specifications, and finishes for all conditions. Supply of materials, application, supervision, on sites throughout the world.
The photograph shows view of furnaces on Pyrolysis Unit, Shell Chemical Plant, Stanlow, Cheshire, England.
A Shell Photograph
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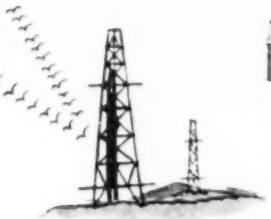


25 SERVICES 1 TRIP TO THE WELL

THE OLD DUTCHMEN SAID 'SPEAKING IS SILVER AND SILENCE IS GOLD' SCHLUMBERGER SERVICE IS HELD IN STRICT CONFIDENCE

TIME IS MONEY AT THE WELL PRINTING AND DELIVERY OF COMPLETE PRINTS AT THE WELL

THE OLD DUTCHMEN SAID: DE COST GAET VOOR DE BAET UIT (THE EXPENSES PRECEED THE PROFIT) SCHLUMBERGER BELIEVES THAT MONEY SPENT ON RESEARCH PAYS IN THE LONG RUN

PREVENTIVE MAINTENANCE

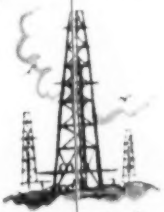
30 SHOTS IN THE WALL OF THE WELL AT THE WILL OF THE OPERATOR: THE SAMPLE TAKER

SELECTED ENGINEERS

THE FIRST AND THE LAST WORD IN LOGGING

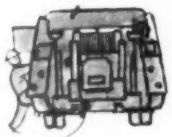
EVERY LOG A QUALITY PRODUCT

THE OLD DUTCHMEN SAID: *Throw a smelt to catch a pike*' THE PRICE OF A SCHLUMBERGER IS NEGLIGIBLE COMPARED TO THE LOSS OF AN OIL FIELD



WELL QUALIFIED PERSONNEL

NIGHT AND DAY



Schlumberger service with a smile

THE OLD DUTCHMEN SAID: *Don't buy turnips for lemons*, YOU CAN DEPEND ON SCHLUMBERGER

ANY WHERE

24 HOURS ROUND THE CLOCK

ANY TIME

ANY WAY!

WALLS CHANGED, GUNS HAD TO CHANGE TOO! SCHLUMBERGER EQUIPMENT KEEPS STEP WITH PROGRESS

ENGINEERS TRAINED BY EXPERTS

WHY OPERATORS PREFER SCHLUMBERGER

Schlumberger Well Surveying Corp. • Houston, Texas

How to Assure Low-Cost Steel Valve Service ...in Hot Oil Handling, for example

THE INSTALLATION

In the world's largest natural gasoline and gas cycling plant at Katy, Texas, with Crane steel gate valves on absorption oil heater lines. Working pressure, 160 psi, 520 deg. F.

VALVE SERVICE RATINGS

SUITABILITY:	Fully effective
FEATURES:	Crane Exelloy Trim
MAINTENANCE COST:	Nil – routine care only
SERVICE LIFE:	10 yr. plus – prolonged life assured
OPERATING RESULT:	No shutdowns for valve trouble
AVAILABILITY:	Crane catalog item – No. 33X

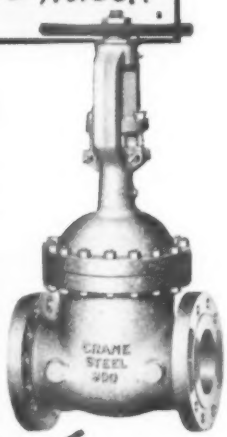
THE CASE HISTORY

Installed as original equipment, these Crane No. 33X 10-inch gate valves have given continuous service since 1943. Year after year, they remain fully effective under severe conditions. They seat tightly with smooth, positive operation, yet with no maintenance other than periodic cleanout of accumulated oil sludge. Their Crane Exelloy seating surfaces show no sign of corrosive or erosive effects. They assure the plant of continued trouble-free, low-cost performance.

Obviously, valves that behave like this aren't bought on price alone. Quality is the first consideration. That's thrifty buying—the only way to get the best value.

THE VALVE

It stands apart from ordinary performance because of pioneering skill in steel casting . . . leadership in design and manufacture . . . and complete suitability for petroleum industries' process and power service needs. Choose from the widest range of body and trim materials, in all pressure classes and sizes, with flanged, screwed, or welding ends. See your Crane Catalog or Crane Representative.



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Branches and Wholesalers Serving All Industrial Areas

VALVES · FITTINGS · PIPE · PLUMBING · HEATING

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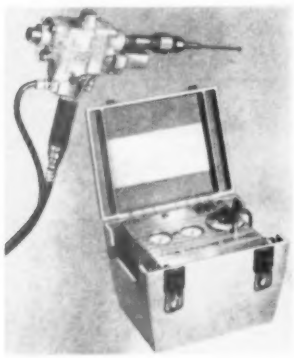
DIGEST OF NEW EQUIPMENT

IT'S NEW ✓ CHECK IT

by Dan B. Miller

1 NEW ELECTRO-PNEUMATIC TUBE ROLLING CONTROL combines the advantages of air operation with precision electric control. The new unit is equipped with an air motor which provides increased power and flexibility to give faster tube rolling and permit the use of only one motor for a wide range of tube sizes, both ferrous and nonferrous. It is capable of rolling ferrous tubes up to 2¼ in. i.d. Pneumatic-electric control insures perfectly controlled amount of tube expansion into the sheet so that tightness and holding strength are held to the exact amount required for the service. Weepers or leakers and the possibility of overrolling are eliminated. Cold work crystallization is minimized to a negligible degree. Distortion or fracture of ligaments in the tube sheet is prevented. *Crane Packing Co.*

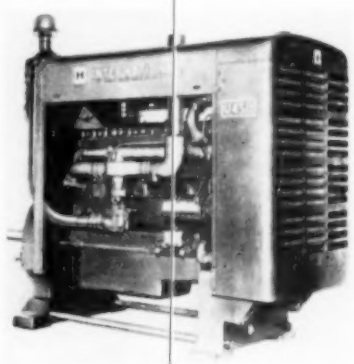


IT'S NEW ✓ CHECK IT

2 CEMENTED CARBIDE. Where excessive sand cutting, corrosion, and electrolytic action are prevalent in flow beans, the wear-resistant qualities of cemented carbide has proved to be especially advantageous. Where these conditions are severe, its resistance to these actions has made it an economic necessity. In positive flow beans, carbide is incorporated in the form of a core tube inside the solid steel body. It makes this core tube, or replaceable bushing, act as a flow-bean orifice. In the adjustable flow bean, cement carbide is used as a cone or needle body, brazed on the valve and a ground seat in the form of a removable bushing in the valve body. In principle, this is a modified needle valve with a calibrated disk mounted on the valve stem for direct reading of the measured opening of the needle in relation to the valve seat. In prorated areas, this choke or flow bean is used to regulate the production per month. *Kennametal, Inc.*

IT'S NEW ✓ CHECK IT

3 SEVEN NEW SIX-CYLINDER CARBURETED MODELS have been recently added to the International power unit line, which now includes 18 diesel, gasoline or gas models ranging from 16.5 to 200 net horsepower. There are 12 gas-gasoline models. The seven new valve-in-head power units and their horsepower ratings follow: for natural gas, model U-1091, 180 net horsepower at 1,375 r.p.m., or up to 200 net horsepower at 1,600 r.p.m. on factory-approved applications; for operation on gasoline, models U-450, 102 net horsepower at 1,800 r.p.m.; U-406, 91 net horsepower at 1,800 r.p.m.; U-372, 83 net horsepower at 1,800 r.p.m.; U-269, 62 net horsepower at 1,800 r.p.m.; U-240, 55 net horsepower at 1,800 r.p.m.; and U-220, 50.5 net horsepower at 1,800 r.p.m. Basically, the new U-1091 and the International UD-24 diesel power units have many common components. Principal differences are that the U-24's gasoline starting system and diesel-fuel injection system have been eliminated in the new U-1091 power unit. The new model is also equipped with lower compression pistons, a large updraft carburetor, magneto, spark plugs, and a gear-driven variable-speed governor. *International Harvester Export Co.*

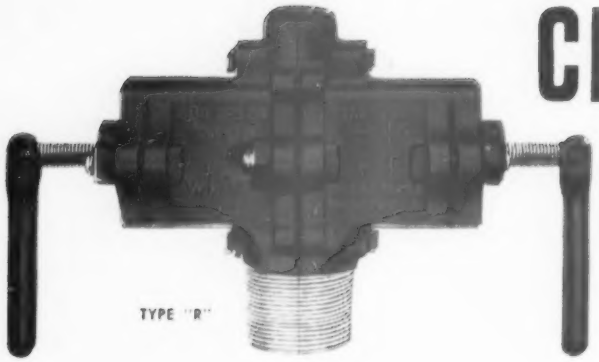


IT'S NEW ✓ CHECK IT

KEEP INFORMED ✓SAVE TIME ✓TEAR OUT CARD ✓CHECK IT ✓MAIL IT

This Digest of New Equipment offers you a quick resume of important features of new or improved products and trade literature and the opportunity to obtain complete information on each subject by use of the convenient "CHECK IT - MAIL IT" service card.

CLEAN FLOOR SAFE DERRICK



TYPE "R"

TYPE "S"

TYPE "D"

TYPE "B" RELEASING ATTACHMENT

GUIBERSON *Wire Line Oil Savers*

for Excellent Pack-Off—Clean, Dry Line

3 to choose from—take your choice and know that if it's Guiberson, it's *good!*

TYPE "R"—for tubing. Simple, inexpensive, effective. Split housing for easy installation.

TYPE "S"—for casing or tubing. Economical, simple—similar to "R" but heavier construction, flange bottom or tubing connection.

TYPE "D"—for tubing or casing. Two independent sets of rubbers, single end operation, make it cost more but still very economical. Pin or flange adapter connection.

Non-sparking brass bushings and guides throughout . . . long-wearing rubbers . . . finest Guiberson precision construction.

TYPE "B" RELEASING ATTACHMENT—
Positive release for Oil Savers—prevents tool damage.
Easy to attach, pressure won't release it.

Better Be Safe than Sorry!

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Sold By Leading Oil Field Supply Stores Everywhere

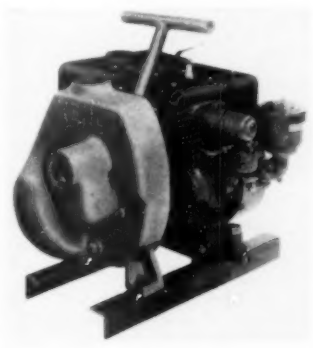
4 GULF CASING SCRAPER is simply and ruggedly designed for removal of mill scale, rust, cement, hardened mud cake, perforation burrs, paraffin, and other deposits from the inside walls of well casing. In operation the tool may be run on tubing, drill pipe, or wire line. Full 360° contact with ample overlap is had on all sizes and weights of casing. Scraping action is performed both on going in and coming out of hole as well as when rotating. Assembly and servicing are easily and quickly accomplished without special tools. *Gulf Tool Co., Inc.*

IT'S NEW CHECK IT

5 NEW R/M SUPER POWER V-BELT. In addition to providing greater horsepower capacity on existing drives, the belt has a long life. On new drives, narrower sheaves may be used, saving space, because fewer belts are required for the same power demands. The new belt also has practically no stretch, virtually eliminating belt-matching problems. Tests show it gives long service, withstands shock with great elastic resistance, and requires little take-up maintenance and few V-belt replacements. The belt has the same advantages of smooth performance claimed for the Condor V-belt, but its design incorporates a new, superstrength, synthetic fiber, strength member for greater power. The new belt's construction is of all-synthetic rubber, and is also oilproof, nonspark, and heat-resistant. *Raybestos-Manhattan, Inc.*

IT'S NEW CHECK IT

6 NEW PORTABLE PUMP is ideal for dewatering flooded areas, for liquid transfer, fire fighting, pumping out pits or quarries, or for water supply for mixers. The new pump is completely self-priming, yet has no valves or moving parts other than the motor, pump impeller, and seal. It delivers over 100 g.p.m. at lowest head, and is capable of forcing water to a maximum height of 100 ft. High suction lift is assured up to and including 25 ft. of lift. It has an open-faced, nonclogging-type impeller. It will handle all of the solids passed by the suction strainer affixed to the end of the suction hose. The impeller is fastened directly to the engine shaft without the use of couplings, keyways or other intermediate devices. The impeller is positioned on the threaded engine shaft by a spacer, then securely tightened to the shaft. Thus, the threaded impeller is maintained tightly in position by engine rotation and yet removal of the impeller can be accomplished by simply unscrewing it from the engine shaft. *Kenco Pump Co.*

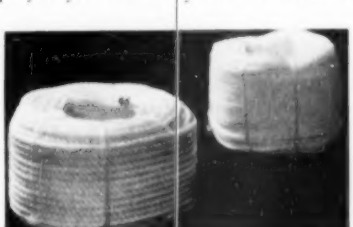


IT'S NEW CHECK IT

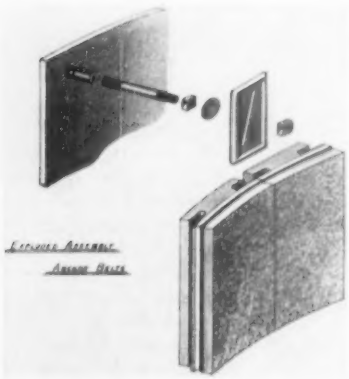
7 NEW AIR HYDRAULIC JACK. A new-type jack incorporates the use of 80 to 100 lb. of compressed air to operate a separate hydraulic pump. The new combination jack and ram consists of a choice of four hydraulic rams, 4½, 7½, 10, and 28 in. in length, which can move 30 tons in any direction a distance of 2, 3½, ⅞, and 20 in. The air motor is mounted on a portable buggy and comes complete with 50 ft. of ½-in. air hose and 6 ft. of flexible hydraulic hose. The pump, buggy, and accessories weigh 150 lb. Among the outstanding features of the new jack, in addition to its ability to save time and labor, is the safety feature which permits operator to stand at a distance in the event the ram should slip while under pressure. *Duff-Norton Manufacturing Co.*

IT'S NEW CHECK IT

8 PLASTIC FILM CONVERTED INTO ROPE is totally unaffected by most acids or alkalies, specifically including sulfuric acid. Both polyethylene and Mylar film are converted into rope. Film is first elongated and spun into thread, then twisted into strands, and finally closed into a multistrand rope, giving a finished product with all the behavior characteristics of natural fiber ropes. Polyethylene has the advantage of a cost comparable to that of cotton fiber ropes, plus complete and indefinite buoyancy. Mylar, while more expensive and not capable of floating, offers tensile upward of 25,000 psi. compared to 1,800 psi. for the poly ropes. Both materials are impervious to salt water and acids. The new plastic ropes are produced in standard coil lengths and in all regular rope diameters from ⅛ to 1 in., with larger diameters also having been produced to meet special requirements. *U. S. Plastic Rope, Inc.*

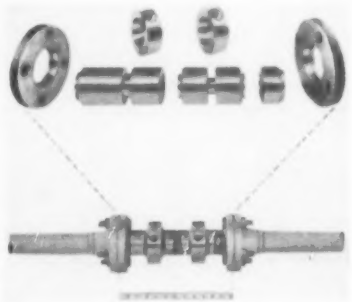


9 REFRACTORY LINING FOR REGENERATORS AND PRESSURE VESSELS. The type of suspension used is capable of supporting the dense refractories against downward, inward, or outward movement. This is accomplished regardless of any changes in operating conditions. The design is simple, the basic principle being that a minimum number of parts are required, and such parts are designed to avoid warpage in manufacture and deterioration in handling. The entire refractory system can be economically installed and repaired. The supports are designed so as not to interfere with the easy and uniform application of castable insulation between the dense refractories and shell wall. This insures the prevention of bypassing of gases behind the refractories. Installation of tight metallic baffles at intervals is used to further reduce the leakage and bypassing of gases. Supports are designed to permit location of tubes or openings wherever the mechanical design of the unit calls for this without having to take the heat enclosure support design into consideration. Supports are also such that there is a minimum amount of heat transfer from the heated refractories to the outer shell. *Geo. P. Reintjes Co.*



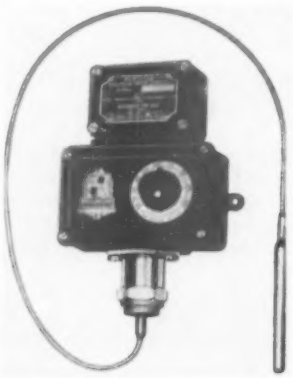
IT'S NEW CHECK IT

10 MINIATURE VENTURI TUBE. Designated the type TF venturi, this unit was specifically designed for the measurement of fluids, gaseous or liquid, in quantities considered too small for the application of a normal size venturi or orifice. This type of tube may be furnished with sizes of inlet of ½, ¾, 1, 1¼, 1½, and 2 in., there being four different ratios of throat to main in each of these sizes. Ordinarily, the type TF venturi is intended for installation directly in the pipe line. In such cases, no supplemental approach or downstream pipe section is provided. When the pipe line is of other than the selected standard ratio venturi, attention to the conditions of approach is necessary. Component parts of the tube are welded together to form a completely integrated assembly, each part having been machined to a tolerance of 0.0005 in. It is furnished with annular pressure-equalizing rings at the point where the main and throat taps are located and usually is equipped with flanged ends. Screwed ends for sleeve couplings may be provided if specified. The TF venturi may be made of cast iron, stainless steel, or bronze, to suit the fluid to be measured. *Simplex Valve & Meter Co.*



IT'S NEW CHECK IT

11 EXPLOSIONPROOF TEMPERATURE CONTROL. A new compact, nonindicating, explosionproof temperature control is for application in many hazardous locations. The control is small in size, only 6½ in. high, 6½ in. wide, and 3¾ in. deep. It has been approved for use in the following applications: Class I, Group C, atmospheres containing ethyl ether vapor; and Class I, Group D, atmospheres containing gasoline, petroleum, naphtha, alcohols, acetone, and natural gas. The Model VS control maintains temperature by controlling flow of steam, oil, or gas. It may also be used to regulate the flow of a coolant, to remove heat rather than supply it. It is especially suitable for controlling all types of appliances where constant visual evidence of temperature is not required. For simplicity of operation the Model VS can be supplied with a calibrated temperature scale. The uncalibrated control is for close control without the temperature indicator. Also, when an independent thermometer is applied as a control point, there is no need for a calibrated control. Dials on uncalibrated controls are marked with divisions from zero to 50 which can logged for duplication in setting. *Partlow Corp.*



IT'S NEW CHECK IT

12 NEW CONTROL PANEL-BOARD PACKAGE. A 10-service, automatic-control panel-board package includes in the arrangement, standard, semigraphic, and graphic control boards. The instrumentation package consists of the following: Instrumentation planning by the corporation's instrument engineers in collaboration with the corporation's or process design engineers; specification and purchase of the instruments; design of the control panel board; fabrication, including mounting, piping, and wiring of instruments; field installation of locally mounted transmitters and controllers, and adjustment of control valves and positioners; field installation of instrument air supply, and of instrument piping to all locally mounted controllers, relays, and control valves; field installation of electrical work necessary for the operation of instruments; field checking of operation of all instruments and associated equipment; field instruction of operating personnel in instrument operation and maintenance; and instrument adjustment during plant startup. *J. P. O'Donnell Corp.*

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TRADE LITERATURE

For Copies of These Informative Brochures, Check the Corresponding Number on the TIME SAVER CARD

13 REFRIGERATION CONDENSERS, AMMONIA AND FREON. Bulletin RC-2 contains engineering data on a complete range of sizes and types for refrigeration service. Sectional blueprints and rating charts contribute to the value of the book. *Henry Vogt Machine Co.*

14 FIBERCAST TUBING AND LINE PIPE covers the advantages and suitable applications for pipe of thermosetting resins, reinforced with glass fibers, and cured by heat. A physical data chart for Fibercast includes ultimate tensile, tensile yield, compression, expansion, moisture absorption, dielectric, impact, hardness, and distortion properties. *Youngstown Sheet & Tube Co.*

15 NEW "KEL-F" BUYERS GUIDE. Sources of Kel-F polymer materials, finished products, as well as application services offered by more than 75 United States and Canadian companies, are readily available in a quick-reference Buyers' Guide. A special section is devoted to firms qualified to render corrosion-control services, based on protective coatings and linings of Kel-F polymer. A master directory section provides complete company names, addresses, and the name and telephone number of a company representative to be considered. *M. W. Kellogg Co.*

16 NEW MULTI-POINT RECORDER - CONTROLLER BULLETIN. An informative four-page technical data bulletin covering Multi-Point circular chart recorders describes and illustrates many new design features. Fielden's exclusive Turret pen assembly makes possible six individual records on a single circular chart. Through a segmental chart drive unit, the new Fielden instrument becomes either a 24, 48, or 96-point multirecord system. *Fielden Instrument Division.*

17 BASIC PLANNING — PLANT MODERNIZATION AND EXPANSION is the title of a new study to help guide company management and engineers in dealing with the complex problems of modernizing and expanding plant facilities. The 16-page publication outlines a detailed step-by-step procedure for analyzing existing plant facilities to establish type, quantity, and value of products which should be manufactured; type, number, and cost of tools, equipment, and machinery required; and size, location, and cost of floor space needed for projected modernized or expanded plant and production facilities. *Walter Kidde Constructors, Inc.*

18 BEARING SELECTION. Basic technical data, facilitating selection of the proper bearings for any installation, feature the new Catalog 61, descriptive of Torrington heavy - duty needle bearings. Particularly helpful to designers and engineers are numerous pages of cross-section drawings showing the details of typical installations, and a bearing - recommendation sheet for indicating detailed requirements from which Bantam's engineering division may develop specific recommendations. *The Torrington Co., Bantam Bearings Division.*

19 PETROLEUM PUMPS. Form No. O - PP - 11B - Rev. describes Gorman-Rupp modification of vertical self-priming centrifugal pumps Model "O" series. New cartridge design permits removal of pump elements without breaking piping, checks spillage. These forms fully explain and illustrate with specifications and performance graphs. *Gorman-Rupp Co.*

20 ELECTRICAL MEASURING INSTRUMENTS. This 12-page bulletin is an excellent guide for the selection of electronic and electrical measuring instruments and accessories for laboratory or industrial requirements. A wide variety of instruments are illustrated and described. Typical items included are: electronic electrometers; electronic relays; audio frequency oscillators; wheatstone bridges; potentiometers; resistance standards; frequency meters; fluxmeters; and oscilloscopes. *Central Scientific Co.*

21 NEW THERMOCOUPLE PROTECTION TUBE. A new bulletin describes a metal-ceramic thermocouple well. The bulletin outlines all properties and specifications of the new protection tube, which combines the thermal conductivity and shock resistance of metal with the corrosion and deformation resistance of ceramics. The wall of the tube has the same thermal conductivity as cast iron, and although it is only ⅛ in. thick, only single-wall construction is needed. *Bristol Co.*

22 FLEXON METAL HOSE. A 32-page illustrated catalog on all types of Flexon metal hose covers the full range of the company's manufacture in Rex-Weld corrugated metal hose, Rex-Tube convoluted hose types, Rex-Flex stainless-steel flexible metal hose, and numerous special - purpose assemblies. Featured is new industrial Rex - Flex heavy - duty stainless - steel hose. Also covered are coupling types and installation information. *Flexonics Corp.*

23 WELDING WITH AMPCO BRONZE ELECTRODES-FILLER ROD-WIRE is the title of the new 24-page Bulletin W-17 describing a complete line of products for use with metal-arc, carbon-arc, inert-gas tungsten-arc, submerged-arc, and inert-gas consumable-electrode processes. Included in this bulletin are valuable up-to-date technical information and data relative to welding with bronze electrodes and filler rods. Specific sections included cover Phos-Trode electrodes, Ampco - Trode electrodes, and filler rods, welding techniques, welding processes, recommended welding currents, machining information, welding procedures, Ampco 8 welding procedures, selection and preheat chart, and a weldability chart. *Ampco Metal, Inc.*

24 WELDED FABRICATION illustrates some of the wide range of vessels from domestic boilers to chemical plants, from galvanized tanks to stainless fractionating columns. The 68-page multicolor catalog describes gasoline and oil storage tanks, mixers, dryers, and stainless, stainless clad, and monel vessels. There are also a tank-capacity chart and numerous pictures of site installations. *Robert Jenkins & Co., Ltd.*

25 ELECTRONIC TEMPERATURE CONTROLLER. Bulletin P-811 covers the Honeywell new 077 electronic temperature controller, with range now extended to cover −100° to +600° F. Bulletin also contains complete specifications, prices, and application information on the controller in both the single-point and the new cascade model, as well as data on resistance of thermometer elements. *Industrial Division, Minneapolis-Honeywell Regulator Co.*

26 UNI-PAC DEAERATING HEATER. Publication No. 4643 describes a unit designed specially for small and medium-size power plants. The deaerator is completely self-contained, and factory assembled for easy field installation on a variety of storage-tank sizes by purchaser's personnel. The Uni-Pac delivers guaranteed zero-oxygen boiler feed water at low capital outlay. Operation, design, capacities, and detailed advantages are fully described. *Cochrane Corp.*

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S-1

PIPE LINES

Part of 540-Mile Yellowstone Products System Completed

BILLINGS, Mont. — Approximately one-fourth of the 540-mile, 10-in. Yellowstone products line being laid from Billings to Spokane has been completed.

Completed portions of the line include a 75-mile stretch between Helena and Bozeman, Mont., by Associated Pipe Line Contractors, Inc., Houston. Over-all engineering and supervision is being handled by Continental Pipe Line Co. through the newly formed Yellowstone Pipe Line Co.

Continental engineers figure that the toughest part of the $20,000,000 construction project lies ahead when the line crosses the Rockies and the Continental Divide. Also, eight major river crossings are planned with an average span of 800 ft., the looping Coeur d'Alene River will be crossed 30 times.

When the line is completed in September 1954, it will transport initially 30,000 bbl. daily from the Billings refining area to Spokane. Those sharing in ownership of the line include Continental, Interstate Oil Pipe Line Co., Union Oil Co. of California, and H. Earl Clack interests *(The Oil and Gas Journal, September 28, page 167).*

Completion Nears on 73-Mile, 30-In. California Gas Line

LOS ANGELES.—A 73-mile, 30-in. natural-gas line is expected to be completed and placed in operation in Riverside County, California, next week by Southern California Gas Co. and Southern Counties Gas Co.

Divided into three sections, one portion of the new loop line runs 37.5 miles parallel to the "Biggest Inch" from Blythe, Calif. The other two sections cover 33.5 miles between Whitewater and a point near the Cactus City, Calif., booster station. Construction is being handled by River Construction Co., Fort Worth.

The new $5,300,000 line is part of a $210,000,000 expansion program to supply California with an additional 300,000,000 cu. ft. of gas daily from West Texas and New Mexico fields. Half of this new supply will go to the two aforementioned gas companies, and the remainder will be delivered to Pacific Gas & Electric Co., San Francisco. The expansion program is being carried out by these three California companies and their supplier, El Paso Natural Gas Co. When the expansion is completed late this year, all four companies will have a $500,000,000 investment in pipe-line facilities delivering Southwest gas to California consumers *(The Oil and Gas Journal, September 21, page 372).*

Gulf Completes Extension Of New Mexico Crude Line

HOUSTON. — Gulf Refining Co. here has completed a 63-mile extension of an existing 10-in. crude line in New Mexico.

A 10-in. extension taps the existing line at the company's Lea County station and runs northward 23.4 miles where it branches into a "Y" with two 8-in. lines. One of these branches extends westward about 22.7 miles to the Anderson Ranch field, and the other runs 16.9 miles northeast to Denton field.

Cities Service to Expand Gulf Coast Crude System

BARTLESVILLE, Okla.—A 60-mile, 12-in. extension is planned by Cities Service Pipe Line Co. here for its 20-in. crude system running from Sour Lake, Tex., to Lake Charles, La.

The extension will run from Sour Lake to the Houston area. This will enable Cities Service's affiliate, Texas-New Mexico Pipe Line Co., and other pipe-line firms to transport their crude to Sour Lake for further transportation to Lake Charles.

Initially, the new line will have a capacity of 48,000 bbl. daily with present plans calling for a pump station and six 120,000-bbl. floating-roof tanks to be constructed at Houston. Construction is expected to get under way the first of March, with completion set for early next summer.

Goodall Places New Colorado Crude Line in Operation

OMAHA.—A 45-mile, 8-in. crude line tapping three northeastern Colorado fields has been completed and placed in operation by Goodall Pipe Line Co. here.

Crude for the $1,100,000 line comes

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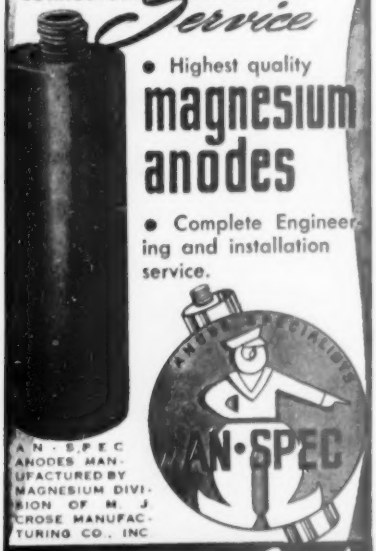

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from a new gathering system in the Badger Creek, Little Beaver, and Middlemist fields located in Adams and Washington counties. The crude is transported to Merino, Colo., where it enters Sterling Pipe Line System, which connects at Gurley, Neb., with Platte Pipe Line Co.'s 20-in. crude line to the Wood River, Ill., refining region.

Engineering and construction of the line, which began last October, was handled by Sinclair Pipe Line Co. The line has an ultimate capacity of 20,000 bbl. daily.

Plains Crude System Sold

NEWCASTLE, Wyo.—The Clint Murchison interests of Dallas have purchased Plains Pipe Line Co. and all of its facilities here, according to Robert Olds, president of Northeastern Wyoming Oil Producers Association.

The selling price was undisclosed. All told, the Plains system consists of 250 miles of 4, 6, and 8-in. lines in eastern Wyoming providing Weston County producers with crude transportation from Mush Creek to Newcastle and Lance Creek.

Olds stated that Murchison plans to loop 15 miles of the system from Clareton field in Weston County to the Mush Creek pump station. The system's present capacity is about 17,000 bbl. daily.

Crude from Clareton field will enter the Rocky Mountain Pipe Line Co. system at Lance Creek for further distribution in the West, Olds said.

Underwater Oil Line Sought

CORPUS CHRISTI.—C. G. Glasscock Oil Co. is seeking permission from U. S. Army Corps of Engineers to lay an 8,310-ft., 2-in. underwater crude line from Copano Bay production in South Texas to a shoreline point 10.5 miles north of Rockport, Tex.

The proposed line would be laid through state tracts Nos. 2, 3, 4, and 12.

Kansas Gas Line Approved

WASHINGTON.—Cities Service Gas Co., Oklahoma City, has received Federal Power Commission approval to use a 10-mile gas line in Sedgwick County, Kansas.

The line, built in 1952 to replace a 14-mile line, serves the Mulvane and Derby, Kans., area. Pipe from the old line was used in the construction of the new facilities which cost $83,671.

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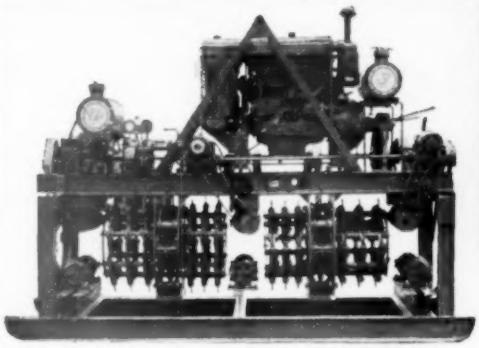
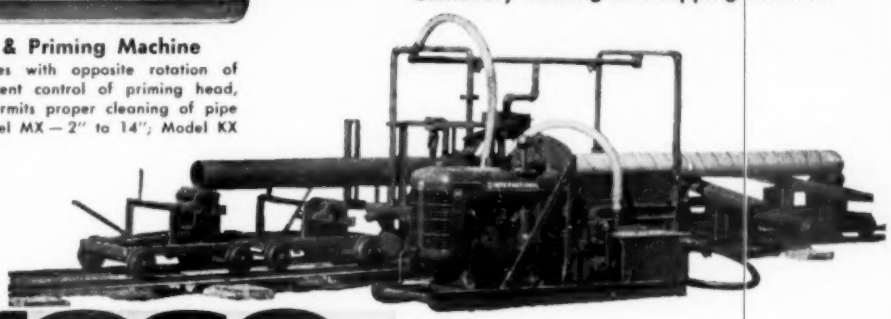


Stationary Cleaning & Priming Machine
Has dual head assemblies with opposite rotation of cleaning heads. Independent control of priming head, and pipe input speeds permits proper cleaning of pipe in various conditions. Model MX — 2" to 14"; Model KX — 16" to 26".

Stationary Coating & Wrapping Machine



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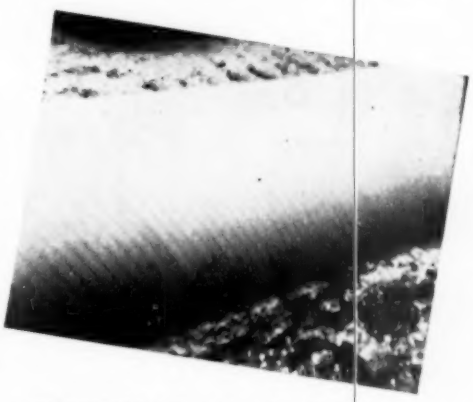

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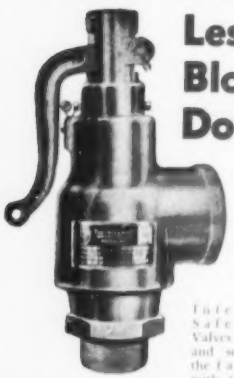

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Among the Drilling Contractors

Contracts Authorized for Long Beach Harbor Wells

LONG BEACH, Calif.—Fred Johnson Drilling Co. and Camey Drilling Co. were the successful bidders on new wells Long Beach Oil Development Co. plans to drill in the Long Beach harbor area during the first 6 months of this year. Crawford & Hiles will handle redrilling operations.

Five contractors offered bids for the new drilling operations, sub-contracts for which have been authorized by the Board of Harbor Commissioners. Fred Johnson Drilling Co. was the lowest bidder, but, having only two rigs available, it was authorized contracts for only two of the three groups of wells to be drilled. Camey Drilling Co., which will be given contracts for the third group of wells, was the second lowest bidder.

Lavaca Drilling Co. has a new contract job under way for Christi, Mitchell & Mitchell at 1 Bob Smith fee, a wildcat test northwest of Mykawa field, Harris County, Texas Gulf Coast. Hole is projected to 11,500 ft.

Zach Brooks Drilling Co., El Dorado, Ark., is contractor and joint operator with George M. Harris, of Houston, on a 9,500-ft. Smackover test projected for the area 2½ miles south of Randolph, in northern Union Parish, northern Louisiana. The test is listed as 1 Baxter, with location in 32-23n-3w.

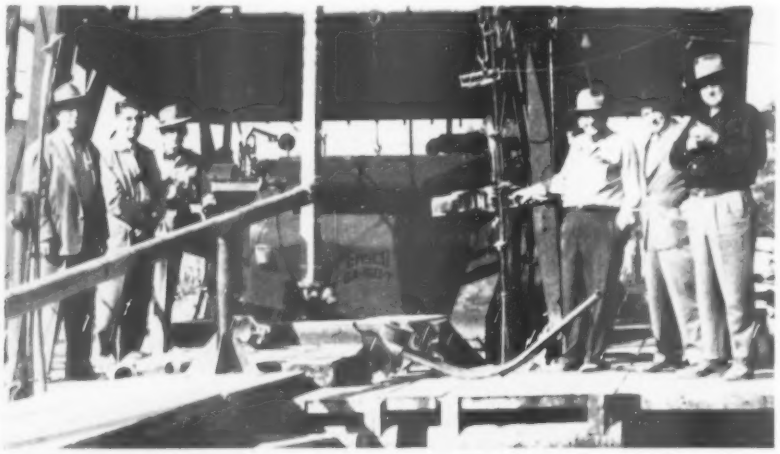
Wichita Drilling Company Completed Incorporation

Incorporation of Anschutz Drilling Co., Wichita, Kans., drilling contracting and operating firm, has been announced by Fred B. Anschutz, president of the new organization. Associated with Anschutz in the new organization is John W. McKnab, formerly president of Saturn Drilling Co., also of Wichita. G. Koelling is resident agent.

The new corporation currently is operating 9 drilling rigs in Kansas, Oklahoma, and the Rocky Mountain region. Authorized capital is listed as $200,000.

Yoachum Drilling Co. has a new wildcat operation under way 3 miles south of Newsome, in Camp County, East Texas, where it is drilling for D. E. Proctor at 1 Florence. Location is in the Mary Arocha Survey.

Petersen Drilling Co., Shreveport, has contracted for a lower Tuscaloosa test to be drilled for D. C. Latimer, of Jackson, Miss., at a wildcat location 2 miles northeast of Columbia, in 27-4n-18w, Marion County, southern Mis-



Claude L. Trusler (third from right) and Louis P. Galambos (extreme right), independent operators and drilling contractors in Kentucky, with their Emsco GA-160-T rig, now drilling near Geneva, Ky. Between them is C. H. Fischer, Continental Supply Co. At the left, left to right, are: W. R. Cooper and O. S. Fry, also of Continental, and Ira Copley, tool pusher on the rig. Trusler and Galambos operate as Ardee Oil Co. The rig has drilled 14 wells to depths of 2,500 to 3,200 ft. in the Henderson, Ky., area.

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sissippi. The rig assigned to the job currently is on a deep wildcat operation the contractor is drilling east of Lumerton, in southeastern Lamar County.

Mobile Drilling Co., Mobile, Ala., is scheduled to drill a 7,300-ft. Wilcox test for Durbin Bond & Co., Inc., of Little Rock, Ark., at an outpost location southwest of Fairview field, Concordia Parish, Louisiana. Location is at 1 Sharp, in 13-4n-9e.

Del Mar Drilling Co., Corpus Christi, Tex., has contracted for an 8,000-ft. test to be drilled for Vaughn, Zoch & Turner at a wildcat location, 1 Binkley, 4 miles southeast of Charco, in Goliad County, South Texas. Location is 2 miles north of Angel City field.

Hinkle Drilling Co., Houston, has a rig working on wildcat test C. B. Webster, trustee, is drilling northeast of Hartburg field, in Newton County, southeastern Texas. Location is on the operator's Glidden lease, in J. R. Morrison Survey.

Sutton Drilling Co. has a new contract job under way in Caldwell County, Southwest Texas, where it is drilling for Rock Hill Oil Co. The test, 1 Hay, is a wildcat in J. B. Klecamp Survey.

Goldrus Drilling Co., Houston, is drilling for McAlester Fuel Oil Co. and Goldston Oil Co. at 1 Hirsch, a newly started operation in the active Bender area of southern Montgomery County, Texas Gulf Coast.

Cable Tool & Rotary Drilling Co. has a contract with J. K. Hughes, of Mexia, Tex., for a 5,500-ft. test to be drilled east of McCoy in Kaufman County, East Texas. Location is for 1 Eubank, in the Silas Edens Survey.

ACTIVE ROTARY RIGS*

Area—	Week ended 1-4-54	Change week ended 12-28-53	Change week ended 1-5-53
Gulf Coast	589	—16	—44
N. & W. Tex.-N. M.	764	+ 5	—45
Ark.-N. La.-E. Tex.	173	—26	+34
Oklahoma	353	— 9	+11
Kansas-S. Nebraska	137	+ 9	—22
Illinois-Eastern	125	—13	+10
Rocky Mtn.	281	+10	+50
Pacific Coast	169	— 1	—11
Total U. S.	2,591	—41	—17
Western Canada	144	—19	—23
Total	2,735	—60	—40

*Courtesy Hughes Tool Co. Trends in drilling activity in the United States, North and West Texas-New Mexico, and Oklahoma-Kansas are shown on pages 180 and 181.

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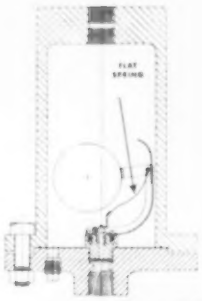

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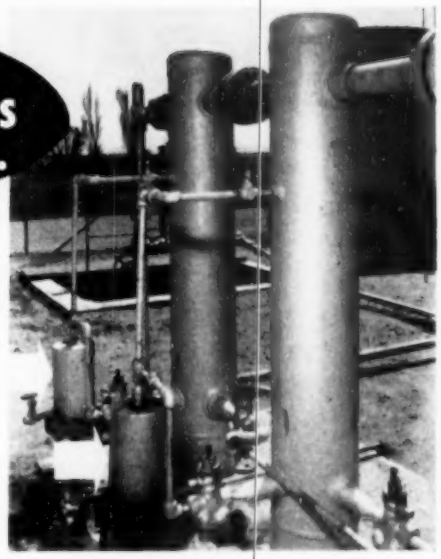

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NATURAL GAS

Utah Field Grows

Clear Creek production extended over 2 miles

SALT LAKE CITY.—Completion of Three States Natural Gas Co.'s 1 C. K. Steiner "A" in Emery County, Utah, as a 2⅓-mile extension of Clear Creek gas field has added 200 billion cubic feet of gas to the field's gross reserve, according to John A. McGuire, Three States president.

The new well, in Section 5-15s-7e, was completed flowing an estimated 20 to 30 million cubic feet of gas daily from the Ferron sand series topped at 4,341 ft. Nearest producer was the company's Helen E. Walton "A" 3, 2⅓ miles to the northwest, which was completed for 112,000,000 cu. ft. of gas daily, absolute open flow.

Reserves hiked . . . Geologists now estimate, McGuire said, that 4,600 proved acres have been added to the field due to the new discovery, boosting the total to 21,600 acres. Proved reserves for the field were estimated at 955 billion cubic feet. Three States' net interest in the field reserves now amounts to 440 billion, he said.

The well was the thirteenth Ferron sand gas producer in Clear Creek field and the fourteenth gas well on the Wasatch Plateau structure. Three other wells are drilling.

About 50,000,000 cu. ft. of gas daily is being taken from Clear Creek field to Provo and Salt Lake City by Utah Natural Gas Co. Well-head price in the field is 15 cents per M.c.f.

Approval to Sell Subsidiary Sought by Cities Service

KANSAS CITY.—Cities Service Co. has asked Kansas City officials to approve a $32 million sale of Gas Service Co., a Cities Service subsidiary, to Missouri Public Service Co.

The city is intervening in the sale in order to protect the interests of Kansas City customers supplied by Gas Service. All told, the company supplies 450,000 consumers in the Kansas City area and throughout Kansas and Missouri. After the sale clears the city commission, it must be approved by the Missouri Public Service Commission and the Securities and Exchange Commission.

The purchaser, which submitted substantially the highest bid of four offered for the property, plans to finance the project by borrowing $18 million from three banking firms, and sell $14 million of Missouri Public Service common stock. Then the two companies will merge and offer $18 million of stock in the new organization to retire the loans.

The sale is part of a plan by Cities Service to move out of the natural-gas business. The company also plans to sell its holdings in Republic Light, Heat & Power Co., and Penn-York Natural Gas Corp. to National Gas Co. Cities Service subsidiaries operate production, transmission, and distribution systems in Kansas, Oklahoma, Missouri, Arkansas, Nebraska, Texas, New York, and Ontario *(The Oil and Gas Journal, January 4, page 112).*

Olin Interstate Plans Merger With Interstate Natural

WASHINGTON.—Olin Interstate Corp., a wholly owned subsidiary of Olin Industries, Inc., of New York, is seeking Federal Power Commission authority to merge and operate all facilities of Interstate Natural Gas Co., Monroe, La., in which Olin Interstate owns 99 per cent interest.

If the application is approved, Olin Interstate plans to change its name to Olin Gas Transmission Corp. Interstate Natural's facilities are located in Louisiana and Mississippi. It controls substantial gas reserves in Monroe field in Louisiana.

Olin Interstate was formed last June when Olin Industries acquired control of Interstate Natural in a $42,000,000 stock transaction. At that time, John M. Olin, president, said his company bought controlling interest in the firm in order to carry out an extensive exploration and development program in East Texas, Arkansas, and Louisiana *(The Oil and Gas Journal, June 29, 1953, page 139).*

Natural Gasoline

Cities Service Plans New West Texas Cycling Plant

BARTLESVILLE, Okla.—Cities Service Oil Co. here has announced it will construct and operate a natural-gasoline plant in West Seminole field of Gaines County, Texas.

The plant will be constructed on a 160-acre tract located about 6 miles west of Seminole, Tex., and 20 miles east of Hobbs, N. M. It will process all gas from West Seminole field and turn out approximately 1,310 bbl. of natural gasoline and L.P.G. daily. The contractor, Delta Engineering Corp. of Houston, expects to start construction immediately.

In addition to Cities Service, others participating in the project include Atlantic Refining Co., Burdell Oil Co., Magnolia Petroleum Co., Sinclair Oil & Gas Co., and Great Western Drilling Co.

Ohio Standard Plans Cavity Storage for Propane at Lima

LIMA, Ohio.—Two 30,000-bbl. caverns will be excavated at the Lima refinery of Standard Oil Co. (Ohio) for use in storing propane produced in the 43,000-bbl. per day refinery.

This project, expected to cost about $450,000, will permit a higher recovery of propane in the plant's light-ends processing facilities.

The program was first suggested by reports of local water-well drillers that the plant is underlain by a solid shale bed approximately 400 ft. thick. Core drilling confirmed this and showed the shale section, topped at about 75 ft., to be sufficiently impermeable for pressure storage of the light hydrocarbon.

Mining of the cavern will be supervised by the production department of the company. A 12-ft. diameter working shaft will be sunk on the refinery site. From the base of this shaft, two corridors, 20 ft. wide, between 40 and 60 ft. high, and about 100 ft. long will be excavated, with the ceiling about 400 ft. below ground surface. The caverns will be capable of withstanding pressures up to 400 psi.

When the project is completed, liquid propane will be charged to storage through 3-in. lines extending to the cavern ceilings. Withdrawals will be made through lines in the shaft. The company is now core drilling the site of the Toledo refinery to find whether underlying rock formations will permit construction of similar underground L.P.G. storage there.

Plant Expansion Progresses

ELK CITY, Okla.—Expansion of the Elk City natural-gasoline plant to double its present processing capacity is nearing the half-way mark.

Presently six 1,760-hp. compressor units have been installed in the plant. Vessels and a 62-ft. absorption column and 100-ft. fractionating column are expected to arrive this month. Fluor Corp., Ltd., the contractor, expects to complete the entire project this spring.

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REFINING

Sioux Buys Cooperative's Newcastle, Wyo., Refinery

NEWCASTLE, Wyo.—Sioux Oil Co. has added a third refinery to its holdings by acquiring the 2,000-bbl. per day plant here of Cooperative Refinery Association.

Purchase of the property, according to C. F. Harshfield, Sioux president, includes the plant, machinery, equipment, inventory, and supplies as of February 1, when Sioux will take possession.

The purchase gives Sioux 5,000 bbl. per day in crude-refining capacity, including two plants now operated by the company; a 500-bbl. per day skimming plant at Chadron, Neb., and a 2,500-bbl. per day skimming plant at Newcastle. The Cooperative refinery includes a 700-bbl. per day thermal cracking unit.

Standard Plans Ultraformer

CASPER, Wyo. — Standard Oil Co. (Ind.) has awarded Lummus Co. contract for construction of a new 3,750-bbl. catalytic Ultraforming unit at its 20,300-bbl. refinery here.

The proposed unit will employ a new refining process for upgrading gasoline developed recently at the company's Whiting, Ind., laboratories. Construction of the new unit will begin in late spring, with completion set for early 1955.

Petrochemicals

New Para-Xylene Plant Opens

BARTLESVILLE, Okla. — Production of 98 per cent minimum-purity para-xylene has begun in a new plant which Phillips Chemical Co. recently completed near Big Spring, Tex.

Phillips states that this is the first commercial production of the important new synthetic fiber basic in that form of purity.

Charge stock from the Phillips plant is obtained from the nearby refinery of Cosden Petroleum Co. Over a year ago, Cosden placed on stream a 4,500-bbl. per day Platforming unit which

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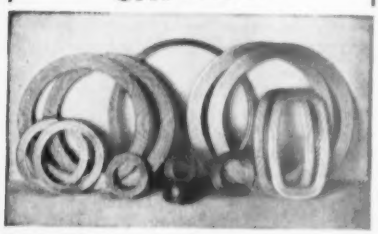

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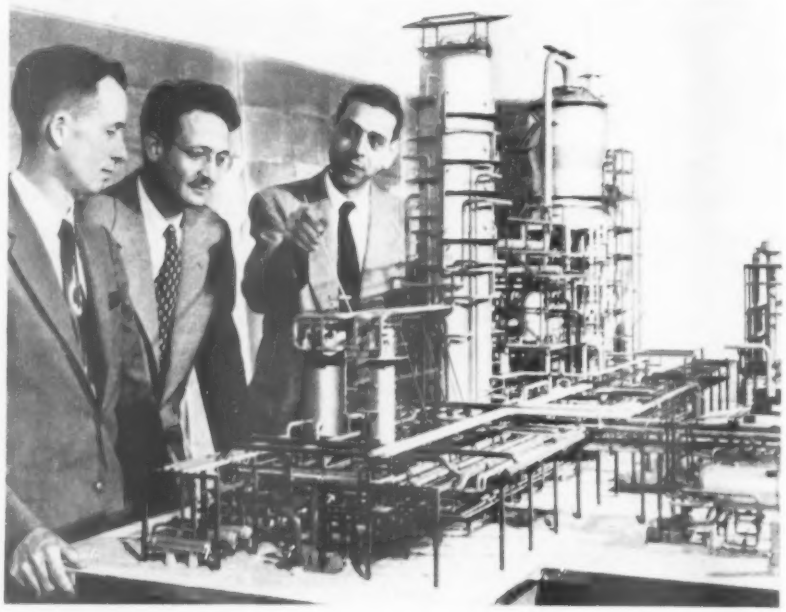

Three-Dimensional Blueprint of Huge Norco Cracker

This model of Shell Oil Co.'s new 72,000-bbl. per day fluid catalytic cracking unit now building at Norco, La., is called a "3-dimensional blueprint" by Shell engineers and field construction workers. The model, measuring 8 ft. in length, 4 ft. wide, and 3 ft. high, is made to an exact scale of ¼ in. to the foot. The unit proper is one of the largest cat crackers in the world. (Right to left) H. H. Wanderman, president of Project Models Co. of New York, explains the features of the model to H. L. Isham, Shell engineer, and H. E. Henslee, of Foster Wheeler Corp., contractor for the unit.

is employed alternately in a blocked-out operation for aromatics and high-octane motor-fuel production.

A Udex unit, operating continuously, separates about 1,600 bbl. per day of platformate produced on the aromatics cycle. The principal products are nitration grade benzene and toluene. A mixed xylenes stream running about 18 per cent para-xylene is moved to the Phillips plant where separation is accomplished by Phillips' newly developed continuous fractional-crystallization process.

According to Phillips spokesmen, the process which resulted from many years of research and pilot-plant work, is applicable in numerous other industries in the difficult separation of mixtures of chemicals having close boiling points.

Shell Forms Ammonia Division

NEW YORK.—Shell Chemical Corp. has formed a new ammonia division, effective January 1, to handle the manufacture, distribution, and sale of ammonia and other nitrogen products for agricultural and industrial uses.

G. R. Monkhouse, vice president of Shell Chemical, has been named to head the new division in San Francisco. Shell increased its lead as the major manufacturer of anhydrous ammonia and ammonium sulfate west of the Rockies with the completion of the new ammonia plant at Venturi, Calif.

L. M. Roberts, general manager of manufacturing in Shell Chemical's New York headquarters, is being transferred to San Francisco to become operations manager of the division. He will head manufacturing, distribution, and marketing engineering and will be in direct charge of the new Ventura plant and the Pittsburg, Calif., plant, the first of its type.

Integrated Platformer, Udex Unit on Stream in Texas

CORPUS CHRISTI. — A new Platformer integrated with a Udex unit for continuous production of aromatic hydrocarbons has gone on stream at Great Southern Chemical Corp.'s refinery here.

In addition to the 4,000-bbl. Platformer and 3,490-bbl. Udex unit, the new installation includes a feed-preparation section and a fractionating section for separation of nitration-grade benzene and toluene.

Originated by Dow Chemical Co., the Udex unit was engineered and licensed by Universal Oil Products Co. Procon, Inc., handled the construction.

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2,5-Dimethyl-2, 4-Hexadiene Tech.
Di-n-Propyl Maleate
Diphenylacetonitrile
Ethyl-3-Oxo-6-Heptenoate
Hemipinic Acid
4-Hydroxycoumarin
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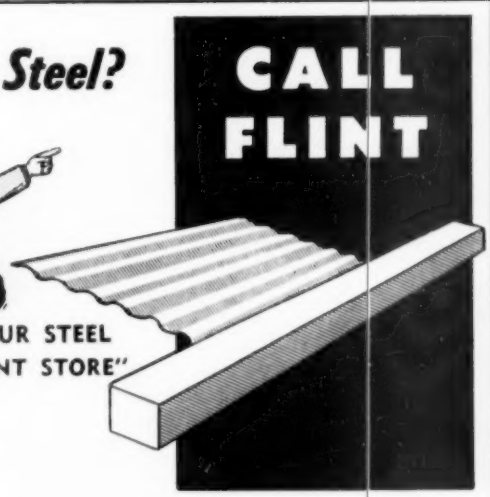

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LEADING THE FIELD OF SEISMIC EXPLORATION

EXPLORATION

Andrews Leads 1953 Discoveries

by Carl Hoot

THE most significant West Texas discoveries of 1953 were those in Andrews County which found oil in deep rocks. These ranged from the Wolfcamp of lower Permian age to Devonian and Ellenburger.

Discovery of Magutex pool in 1952 sparked development of University of Texas leases in eastern and northeastern Andrews. Exploratory drilling in this 100-sq.-mile area was not exactly of boom dimensions, but new wells and long extensions were brought in with regularity throughout 1953.

The central portion, centering around Andrews, witnessed a flurry of drilling, and several high-potential Wolfcamp pools were opened. Many wells in this area, not counted in this listing, were far from production but were not classed as wildcats.

A list of the county's principal discoveries, new pays and extensions made during the year keyed to the map in the order of their completion, follows:

1. Magnolia 1-CA Fasken, IP 200 bbl., Devonian 12,738 ft.

2. Shell 1-A University, IP 471 bbl., Ellenburger, 12,540 ft. Development at year-end was a southwest offset producing from the Devonian.

3. Humble 1-Q University, IP 418 bbl., Devonian 12,509 ft.

4. Magnolia 1-BA Fasken, northwest of Mabee field, IP 114 bbl., Devonian 12,818 ft.

5. Stanolind 13-Q Midland Farms, IP 423 bbl., Ellenburger 12,606 ft. One of several successful Ellenburger extension wells drilled during the year.

6. Phillips 1-RR University, new pay discovery and extension to Devonian pool, dual completion. Ellenburger IP 1,259 bbl., 13,848 ft.

7. Continental 1 McCollum - Weibusch, IP 1,560 bbl., Wolfcamp 8,708 ft., failure in the Ellenburger.

8. Anderson-Prichard 1-E University IP 3,353 bbl., Devonian 12,325 ft., failure in the Ellenburger.

9. Humble 2-O University, southwest of Ellenburger discovery, IP 202 bbl., Devonian 10,780 ft.

10. The Texas Co. 1 Parker-H, IP 1,101 bbl., Wolfcamp, 8,596 ft.

11. Atlantic 1-A University, IP 423 bbl., Wolfcamp 8,430 ft.

12. Fred Turner Jr. 1 Parker, IP 348 bbl., Wolfcamp 8,554 ft.

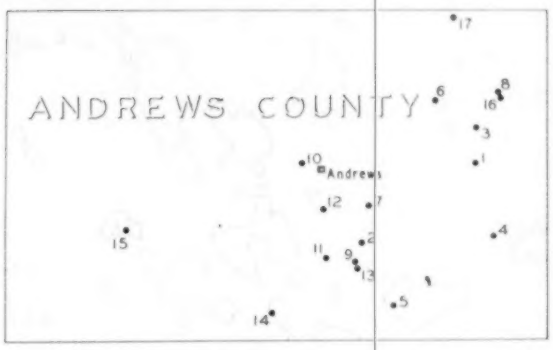
13. Humble 1-T State, two locations south of Devonian discovery, IP 404 bbl., Wolfcamp 9,050 ft.

14. Anderson-Prichard 8 Cowden, on west flank of Emma (San Andres) pool, IP 569 bbl., Ellenburger 12,307 ft.

15. The Texas Co. 1 Texas - Atlantic-Superior, in southeast portion of Block 12 field, IP 630 bbl., Ellenburger 10,117 ft.

16. Anderson-Prichard 1-I University, ninth well and first Ellenburger pay in Block 7 field, IP 703 bbl., 13,475 ft.

17. L. M. Glasco et al 1 Butler, 5 miles north of nearest Devonian well in northeast corner of the county and first of several projected deep tests by several companies. IP 1,973 bbl., Devonian 12,543 ft.



Seventeen strikes finished by year's end, most of them in pre-Cambrian source beds, were outstanding developments of 1953.

The new phase of deep drilling is not limited to Andrews County. It is reflected in pre-Permian discoveries ranging northwest along the Central basin platform from prolific Devonian gas-distillate strikes in Pecos County, through Crane, Ector, and Gaines counties. To the east, in Midland basin fields, there is an increase in deep exploration. Most of this activity is in Upton and Midland counties, but Howard County exploration yielded a good Siluro-Devonian discovery near Vealmoor fields and northwest Yoakum County added discovery oil in the Silurian and Devonian.

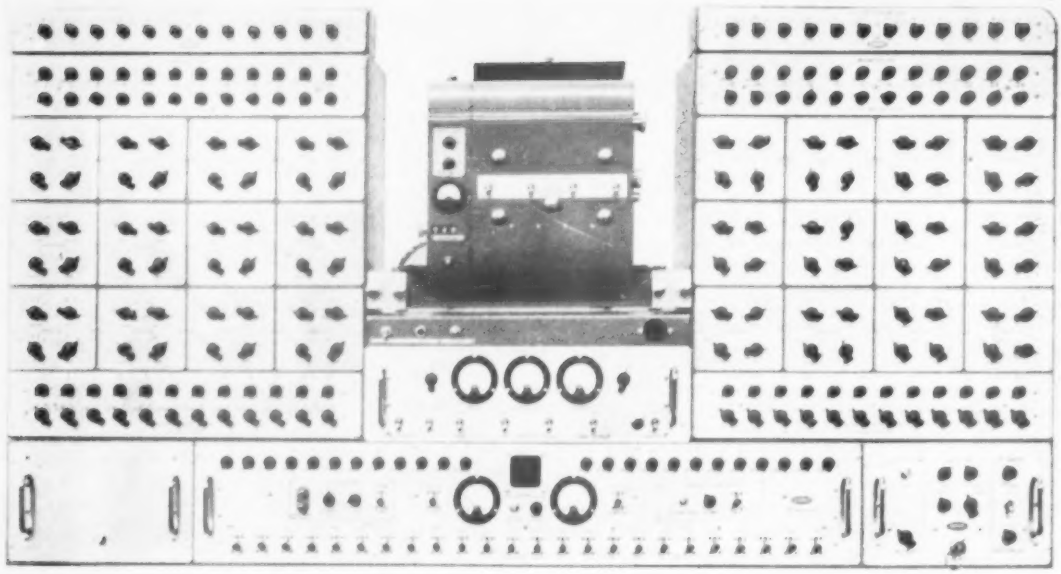
Intensive seismic studies of these areas was started in 1951, which led to the discovery of Magutex, and which apparently has led to the magnitude of deep, high-gravity fields being discovered in 1953. The record of 1953 seems to point to a new trend in West Texas drilling.

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

NORTH DAKOTA . . . Stanolind Oil & Gas Co. completed 1 Starr, C SW SE 21-152n-94w, West Spanish area discovery in McKenzie County, for 550 bbl. of oil per day through 12/64-in. choke. The discovery opens a new producing area about 11 miles east of previous production on the Nesson anticline.

COLORADO . . . The Texas Co. recovered oil-cut mud on test in the Weber (Pennsylvanian) at 14 Knowlton, Lot 5, 9-4n-91w, deep wildcat at Moffat Dome, Moffat County. The well previously found apparently commercial oil in the Shinarump at 5,303-15 ft. The operator topped the Weber at 5,986 ft.

WEST TEXAS . . . Hunt Oil Co. 1 Velma Tippett Amacker, Upton County wildcat, 13½ miles northwest of Rankin, flowed Ellenburger oil at the rate of 104 bbl. per hour on drill-stem test taken at 11,973-12,127 ft. The discovery also flowed oil on a drill-stem test in the Wolfcamp at 8,844-8,933 ft. It is 4 miles southeast of nearest Ellenburger production.



SIGNAL from magnetic recording tape goes through demodulator, then into amplifiers shown in left and right panel banks above.

How Magnetic Recording Aids Seismic Operations

Provides useful records in areas where such records normally are impractical or expensive

by E. J. Handley

ALL geophysicists are well aware that there are many factors which affect the quality and quantity of seismograph operations on a normal crew. In an area that is considered relatively easy to shoot, the effect of these factors is well understood and is consistent and predictable.

In a difficult shooting area, the variables have to be changed in order to find the optimum position for each variable, and generally only one variable should be changed at a time, with all the others being held constant. In an area that is just reasonably difficult, it is probable that the operator would want several shots out of each hole; perhaps one record shot "straight," one record shot "mixed," and perhaps shots with at least two different filter settings would be desirable.

Many times it is physically impossible or economically impractical to obtain numerous shots from one hole.

Author is executive vice president, Midwestern Geophysical Laboratory, Tulsa.

It is not scientifically as satisfactory because one cannot obtain two shots at the "same place." As Dr. J. P. Woods, of Atlantic Refining Co., points out, "after the first shot, the same place is not there any more."

It is obviously advantageous to record a seismograph record on a magnetic tape, thereby enabling the operator to play back the record at a later time and, under controlled conditions, obtain the optimum setting for many of the variables. It should be noted, however, that one is limited to the various improvements that can be made by different instrumental adjustments.

The very important and effective factors pertaining to field technique must be varied at the time the magnetic record is obtained. It is probable that these factors can be reasonably well predicted and controlled for maximum results at the time the magnetically recorded shots are originally obtained. Factors such as hole depth, charge size, spread length, and the number and distribution of geophones, are extremely important and must be studied by the operator. His field technique must be varied accordingly in magnetic recording as with standard operations.

Advantages Described

Some of the more obvious advantages of magnetic recording might be briefly described since they are self-evident. This method, however, is so new that the whole category of advantages pertaining primarily to improving the interpretation of the geophysical data is yet to be developed. The evident advantage pertaining primarily to improving poor records is perhaps the obtaining of useful records in an area where obtaining useful records by normal means is impractical, difficult, or expensive. Very broadly the principal advantage would appear to be concerned primarily with improvement in record quality, rather than in lower cost.

It is possible that lower costs can be realized because of the necessity for fewer shots per hole. Even in a bad area if the field factors are consistent, the operator might well obtain only one shot per hole. There are other costs attendant upon the use of magnetic

recording, however, which might well more than compensate for the savings to be made in time and dynamite. It is questionable, therefore, if one should postulate that an advantage in magnetic recording is lower cost, although this is a distinct possibility, and the technique offers an approach which can be pursued with lower cost as an objective.

Improved Record Quality

The original shot must be recorded with all field factors held to their most favorable position, as previously described. This means that the original broad-band record should be recorded with optimum hole depth, charge size, spread length, and geophone number, position, and distribution.

Assuming this has been done, however, the magnetically recorded shot is then available to be rerun under controlled conditions so that the instrumental factors can be varied at will, and the original intelligence can always be used as the input for each different instrument setting. There are several categories of instrument controls which can be varied in order to obtain optimum record quality; these are mixing, filtering, and automatic gain control.

Single-record mixing . . . The magnetically recorded shot can be played back through the same amplifiers originally used to obtain the broad-band record, and, by means of a mixing panel, a record with "trace-to-trace" mixing can easily be obtained. Normal methods would require either another shot or dual recording.

Mixing controls can also provide for "blend" mixing, provided certain other necessary requirements are met. Use of blend mixing in normal operations is generally severely limited because of phase shifts created by differences in elevations, weathering depths, or subsurface depths. Differences in travel times can be compensated for at the recording head, thus making blend mixing practical and allowing for a considerable improvement in the signal-to-noise ratio.

Multirecord mixing . . . By means of a second recorder, the similar channels from different shots in the same hole, or from shots from different holes at essentially the same location, can be mixed together. The number of shots that can be multimixed is limited to the number of magnetic recording channels available. For example, if one were using a 40-trace recorder, he could record four different shots, each using the same 10-trace spread cable. These four records would represent either four different shots in the same hole or four different holes at essentially the same location, and all would be recorded by the same 10-trace surface spread. The No. 1 channel from each of the four records would be mixed together to form the No. 1 trace of the final record. The No. 2 channel from the four different records would be mixed together to provide the No. 2 trace on the final record, and successively so for the remaining traces. It appears that important improvements in signal-to-noise ratio may be obtained by this type of mixing, and it is entirely possible that areas now considered NR may be economically surveyed by such a technique.

Filtering . . . The seismic amplifiers must have sufficiently versatile filters so that a nearly optimum setting can be obtained for any record. The band pass must, therefore, cover the entire usable portion of the seismic spectrum, and to move the peak position of the band pass throughout the spectrum at sufficiently numerous points to effectively cover the seismic range.

It must be possible to vary the width of the band pass, and to change the effective damping ratio of the filters from an essentially undamped filter, providing for the maximum noise rejection, to a position where the filter is highly damped, providing for maximum resolution and minimum transient oscillation.

It should be noted at this point that by means of magnetic recording, all mixing can be done prior to filtration. This permits the maximum intelligence on the output record. It should be recalled that information theory shows that the amount of intelligence, or "bits" of information, contained in a seismograph record will be a function of the product of the width of the band pass and the signal-to-noise ratio.*

Automatic gain control . . . By means of magnetic recording the original record can be played back through the amplifiers, and the automatic gain control can be adjusted to obtain a desired effect with little effort and small cost.

Instruments in the recording truck to be used with magnetic recording operations should be designed to contain all of the controls that have just been discussed. The broad-band "mother" record which has been magnetically recorded in the field can thus be played back in the truck. Final records can be obtained from the oscillograph to provide records for usual computing procedures.

It is recommended that the playback study and analysis be done in the field on a daily schedule. The field crew utilizing magnetic recording should be able to maintain normal production and conform with the usual requirements concerning the interpretation of the data and the making of scheduled reports.

*Bits $= f \times \log_2 (1 + S/N)$

Where:
Bits = bits of information
f = frequency band width
S = signal voltage level
N = noise voltage level

KANSAS

Twenty New Pools Named in Kansas

The Nomenclature Committee of the Kansas-Oklahoma Division of the Mid-Continent Oil and Gas Association has given names to 20 new oil and gas pools in various sections of Kansas.

Hugoton embayment . . . W. L. Hartman 1 Holsted-Thomason, SW SW SW 25-22s-33w, opens Finnup East pool in Finney County. The discovery well is completing in the Marmaton. United Producing Co. opened Jumbo pool in Gray County at 1 Salmon, C SE NW 29-29s-27w. The Cherokee producer was finaled for 15 bbl. of oil per day. Morton County has a new gas pool at Colorado Oil & Gas Co. and Superior Oil Co. 1 Dreyer "B," NE NE SW 5-32s-43w, in the Greenwood area. The well, opening Dreyer pool, is completing in the Topeka lime.

Helmerich & Payne opened Thirty-One pool in Seward County at 1 Ellis, NE NE SW 18-31s-31w. The discovery was completed for 4,925 M.c.f. of gas per day from the Morrow. In Northwest Kansas Wessel North is a new pool in Sheridan County at 1 Brantley, SE SE SE 16-6s-29w, a Lansing well drilled by Sauvage and Dunn.

Southern Kansas . . . Roundup pool in Barber County was opened by Barbara Oil Co. at 1 Forrester, SW NW NE 28-33s-11w, with a pump potential of 163 bbl. of oil per day from the Mississippi. San Diego Oil Co. opened Roundup South pool at 1 Harbaugh, SE SE NE 33-33s-11w, also a Mississippi producer. Cowley County has two new pools. The Texas Co. opened Wiebe pool at 1 Wiebe, NE NW NW 26-31s-6e. It was finaled for 3,200 M.c.f. of gas per day. K. T. Wiedemann 1 Shane, NE NE SW 1-33s-3e, finaled for 10 bbl. of oil per day from the Bartlesville, opened Centennial North pool. Bitter Creek pool in Sumner County was opened by Alpine Oil & Royalty Co. at 1 Ramp, SW SW SW 1-35s-1e. It is completing in the Mississippi.

Central Kansas uplift . . . Barton County has two new pools. Lewis Drilling Co. opened Buckee South pool at 2 Johnson, C SW NW 23-20s-12w. It is completing in the Arbuckle. Petroleum, Inc. 1 Moses "A," NW NE SW 13-20s-14w, opened Moses pool as a Lansing producer. On the southwest flank of the uplift in Pawnee County GMR Oil Co. 1 Dufford "A," SE SE SE 7-21s-15w, opened Sweeney Southwest pool. It was completed for an open flow of 5,000 M.c.f. of gas per day from the Arbuckle. In Rooks County Brungardt Northwest is a new pool at J. F. Darby 1 Brumitt, SE SW NE 34-10s-17w. It was completed for 125 bbl. of oil per day from the Arbuckle.

Stafford County has two new wells. Pe-

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troleum, Inc. 1 Smith "J," SW NE SE 26-22s-14w, opens Oscar South pool as an Arbuckle strike. Greenland Drilling Co. opened Cleveland South pool at 1 Cadman, SE SE NE 28-23s-14w, as a Lansing producer.

Sedgwick basin . . . Pickrell Drilling Co. opened Spivey South pool at 1 Boyle "A," SW SE NE 27-30s-8w, as a Mississippian producer.

Salina basin . . . At the southern end of the Salina basin Windom pool was opened by Trans-Era Petroleum at 1 Neal, NE SW NE 30-19s-5w. It is completing in the Mississippian. Also in McPherson County Anschutz Drilling Co. opened Groveland South pool at 1 Holloway, NW NW SW 14-20s-4w. It was completed for 141 bbl. of oil per day from the Viola.

Forest City basin . . . Just east of the Nemaha granite ridge on the southwestern edge of the Forest City basin in Morris County, Wm. Gruenerwald opened John Creek pool at 1 Williams, NW NE NW 26-15s-9e. It is completing in the Viola.

ROCKY MOUNTAIN

WYOMING

South Manderson Wildcat Recovers Tensleep Oil

Initial tests of L. J. Peterson's 2 Wycol-Government, C SW NW 1-49n-92w, Big Horn County, Wyoming, recovered some oil from Tensleep, indicating a new pay zone for the area. All previous production in the Manderson area has been from Phosphoria, and has been sour crude. A lack of facility for processing sour crude through the east side of the Big Horn basin restricts Phosphoria production, and renders Tensleep possibilities much more interesting to operators in the area.

Test at the Peterson wildcat was of the zone 5,952-62 ft., and 5,966-70 ft., and recovery was 180 ft. of oil and gas-cut mud and 210 ft. of mud cut, 35°-gravity oil. The operator squeezed off these perforations and was last reported testing perforations at 5,895-5,948 ft. There was gas at the surface after the first 43 minutes of this test, and test was not complete. Saturation was found in Phosphoria in the wildcat, but was not tested.

Two Park County Wildcats Report Shows

Sohio Petroleum Co. recovered gas at the rate of 757,000 cu. ft. per day on test of a formation tentatively identified as Thermopolis at 1 Government-Simmons, NW NW SE 13-50n-100w, in the southeast Oregon Basin area of Park County. Test was of the zone 4,839-51 ft., and there was gas at the surface after 3 minutes. Recovery was 15 ft. of gas-cut distillate. Core 4,934-84 ft. recovered 20 ft. of sand with no show.

The wildcat is about 3 miles south of Tensleep production in Oregon Basin field. It is scheduled as an 8,900 ft. Madison test. The operator is drilling below 5,193 ft.

Stanolind Oil & Gas Co. recovered small quantities of oil on test of Tensleep at 2 Unit, NW SE SW 34-48n-100w, in the northwest Little Buffalo Basin area of Park County. Drill-stem test 4,625-50 ft. recovered 80 ft. of oil-cut mud and five ft. of mud-cut oil. Tensleep was topped at 4,648 ft. and the

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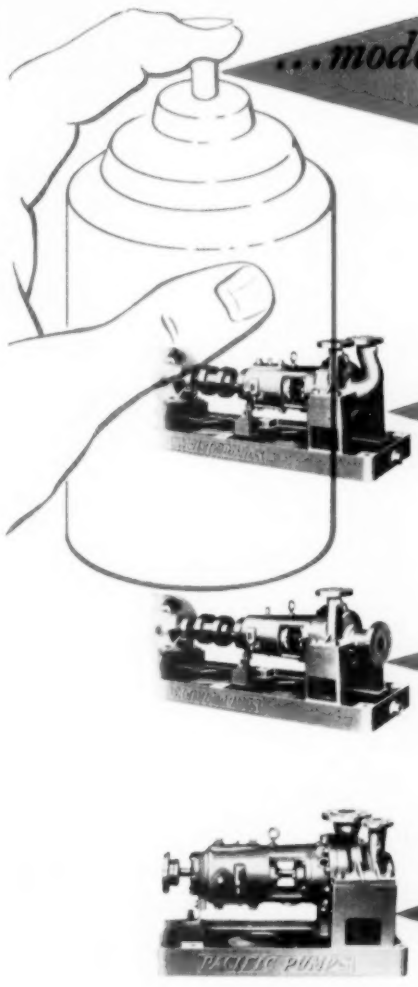

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operator is coring below 4,707 ft. This well is 1¾ mile northwest of production in the northwest area of Little Buffalo Basin field, and is one of several current wildcats being drilled toward the west side of the Big Horn basin, and away from well defined producing structures.

Oil and Gas Shows Reported At Jade Unit Test

Sinclair Oil & Gas Co. recovered gas on tests of Frontier in 2 Unit, NW SW SW 3-28n-93w in the Jade Unit, Fremont County. Some mud-cut, 38°-degree gravity oil was also recovered. Test 3,750-80 ft. had gas in 4 minutes at the rate of 12,000 cu. ft. per day. Recovery was 230 ft. of 25 per cent oil-cut mud. Test 3,780-3,815 ft. made gas in 17 minutes at a 50,000 cu. ft. per day rate, with pipe recovery of 510 ft. of 25 per cent mud-cut oil and 270 ft. of water. Top of Frontier was called at 3,605 ft. The well is northwest of a previous failure in this unit which had noncommercial Frontier shows.

Campbell County Discovery

Trigood Oil Co. of Casper has reported a gage of 125 bbl. of oil per day on pump at 2 Unit, C SW NE 33-53n-70w, in the Mitchell Creek area of Campbell County. The well is a discovery in Minnelusa, topped at 7,644 ft. This formation produced for a short period in the small Adon pool in this county, but has otherwise been nonproductive through the Powder River basin. Production is 25°-degree gravity oil, from perforations 7,636-46 ft. Tests are continuing.

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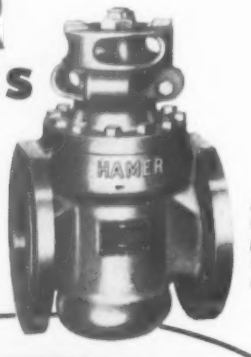

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Carbon County Wildcat Staked

Carter Oil Co. has made location for the first test of the Savery Unit, Carbon County. The operator has held acreage in this area for a number of years with no drilling proposed until the present time. The new wildcat is 1 Unit, C SE NE 17-13n-89w, and is one of two staked by this operator which will be important to Green River basin exploration during 1954.

The second recently announced location is in the Morgan Creek area of Moffat County, Colorado, at 1 Gossard, Inc., SE NE SE 29-5n-93w. It will test to Weber at about 5,300 ft. The Wyoming wildcat is also to be a Pennsylvanian test, with Tensleep objective expected at about 9,000 ft.

Converse County Deep Test Flows Oil

Union Oil Co. of California recovered 54°-gravity oil at the rate of 73 bbl. per day with a flow of 550,000 cu. ft. of gas per day on test of Sussex sand at 1 Unit, C SE SE 29-40n-73w, in the Powell Unit, Converse County.

Perforations were at 9,480-96 ft. and the first tests recovered oil and the rate of 55 bbl. per day with nearly 1 million cu. ft. of gas per day. The well was drilled to total depth of 11,684 ft. and plugged back to test Sussex, topped at 9,474 ft. The operator has shut down because of weather and will acidize before further testing.

MONTANA

Fallon County Wildcat Location Staked

The California Co. has made location for a wildcat in the Pennell Creek area of Fallon County, almost midway between production in Pine Unit and the Cabin Creek fields. The first test of a 23,000-acre unit the wildcat, 1 Unit, C SE NW 15-10n-56e will go to Ordovician at about 10,000 ft. The location is 10 miles southwest of Pine Unit, and 11 miles northwest of Cabin Creek, and is on a separate structure paralleling the Cedar Creek anticline.

COLORADO

Kiowa County Wildcat Preparing to Spud

Superior Oil Co. is moving in materials for a wildcat in the general Eads area of Kiowa County. The new well, 65-23 Weisenbarger marks resumption of interest in this area by Superior. The operator drilled along the same general portion of the Las Animas Arch in 1952. The new test is about 4 miles northwest of Continental Oil Co.'s small gas discovery in Southwest Eads pool which completed last year.

Weber Shows Found at Moffat County Wildcat

The Texas Co. recovered oil-cut mud on test of Weber (Pennsylvanian) at 14 Knowlton, Lot 5, 9-4n-91w in Moffat Dome field, Moffat County. Weber is the principal producing horizon in the Rangeley field to the south.

The formation was topped in the Moffat Dome deep test at 5,986 ft., and test 6,070-6,120 ft. recovered 20 ft. of 40 per cent

oil-cut mud, and 80 ft. of 10 per cent oil-cut mud. The well attracted earlier attention when substantial recoveries from Shinarump indicated a new pay discovery in that formation. The wildcat is to go to an estimated total depth of 6,300 ft., and the operator is drilling ahead below the tested Weber interval.

NORTH DAKOTA

West Sanish Discovery Completed

Stanolind Oil & Gas Co. has completed 1 Starr, C SW SE 21-152n-94w in the West Sanish area, McKenzie County for a flow gage of 550 bbl. of oil daily through 12/64-in. choke. Production is identified as from basal Mississippian by the operator. Perforations are in the zone 10,526-10,556 ft. Tubing pressure on the test was 3,200 psi., and gas oil ratio 700-1. The new pool is 11 miles east of previous production through western North Dakota.

Gulf Oil Corp.-Northern Pacific Railway Co. took two cores at 1 Government-Dorough, C NE SW 24-143n-103w, Trotters area wildcat in Golden Valley County, and recovered faint staining. Carter Oil Co., Sinclair Oil & Gas Co., and Socony-Vacuum Oil Co. recovered water on a drill-stem test at 1 Lockwood, C SE SW 5-147n-93w, Carsin area wildcat in Dunn County. The outcome of both wildcats is of high importance to Williston basin development.

Water Recovered on Test Of Dunn County Wildcat

Carter Oil Co., Sinclair Oil & Gas Co. and Socony-Vacuum Oil Co. recovered water on drill-stem test of 1 Lockwood, C SE SW 5-147n-93w, in the Carsin area of Dunn County. The well previously gave promise of becoming a new western North Dakota pool opener with the recovery of 415 ft. of free oil. In the latest reported test, recovery from the interval 9,067-86 ft. was 30 ft. of slightly muddy salt water and 430 ft. of salty sulfur water. The earlier test was of the interval 9,018-66 ft. and with tool open for 5 hours the recovery included, in addition to the 415 ft. of free oil, 280 ft. of oil and gas-cut mud, mostly oil. Recovery was from Madison.

INDIANA

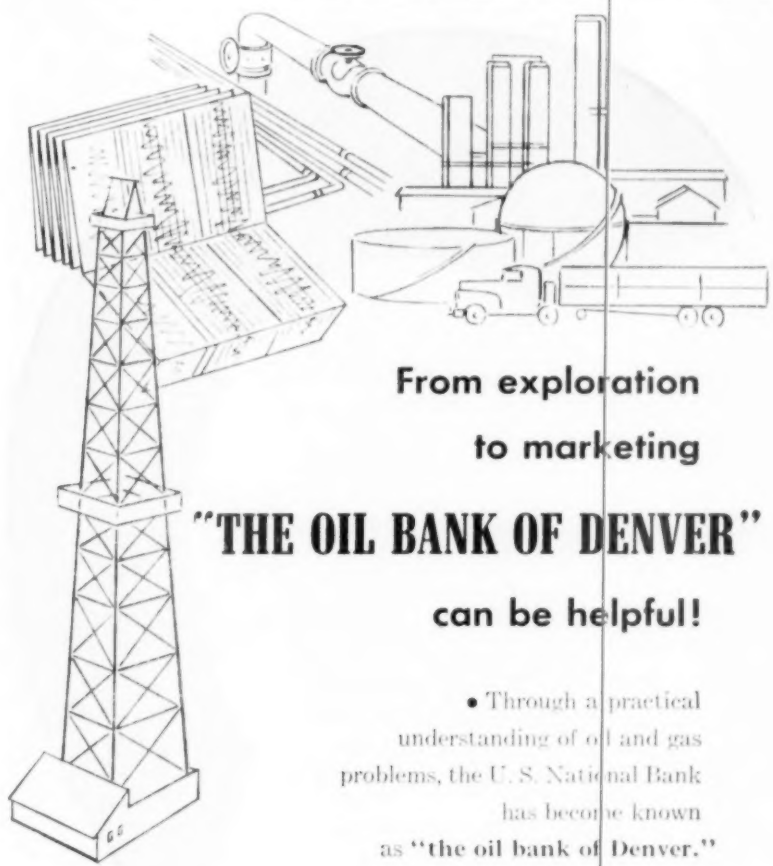
T&H Oil Corp. has just completed 1 Carl and Maurine Medsker, NW NW NE 24-8n-11w, 10 miles west of Sullivan in Sullivan County. The wildcat made 40 bbl. of oil per day, no water, from 6 ft. of Salem at 1,754-60 ft. It is a 5-mile stepout.

MICHIGAN

While production at a restricted rate of 40 bbl. of oil an hour was being confirmed from the W. C. Taggart 3 Curtis, W½ SW SW 28-4s-4e, Bridgewater Township wildcat, Washtenaw County, from an open 5-in. hole natural on initial flow tests after tankage had been installed, Pure Oil Co. was testing a natural flowing 60-bbl. a day oil well at its 1 Gingrich, SE SE SW 30-18n-10w, Lincoln Township, Osceola County, the first Richfield oil well drilled to date in the Reed City field, one of Michigan's best Dundee-Reed City zone pools. While the Washtenaw County strike was more spectacular and offered greater prospect of stimulating new wildcatting in southern and southeastern Michigan, the Pure deeper horizon prospect at a deepening of an older Reed City producer may prove to be of as great, if not greater, importance.

Taggart 3 Curtis is being produced from the Traverse (or possibly the Dundee) at a total depth of about 1,120 ft. Pay was encountered at about 1,030 ft. Well flowed 20 bbl. first half hour and 22 bbl. second half hour when tests were started December 30. Well was restricted even further to about 14 bbl. of oil an hour after flow had been in progress for over 2 hours. This well is being definitely credited as a new pool discovery for 1953.

Pure 1 Gingrich, located close to the west flank of the Reed City producing pool, and at about the center of this flank, logged a Richfield sand pay at 4,633 ft. and about 12



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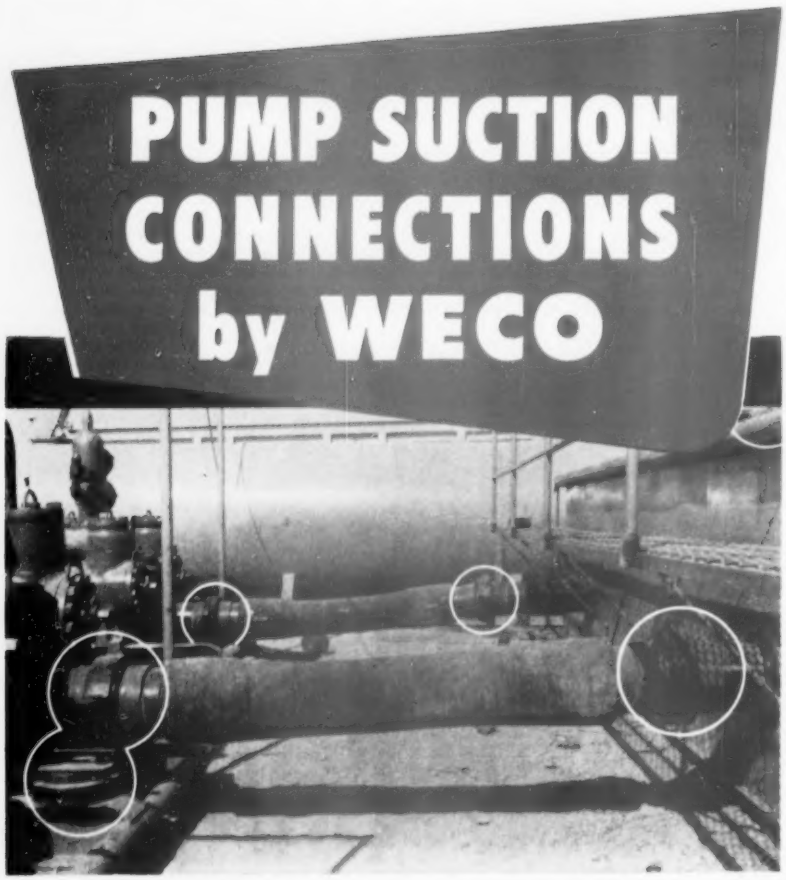

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ft. of sand had been drilled up to 4,646 ft. where it appeared that black lime Richfield base might have been topped. Well was scheduled to be drilled about 20 ft. into the black lime before final completion. The 1 Gingrich swabbed and flowed 65½ bbl. of fluid natural in 21 hours after about 4,640 ft. when but 6 ft. of sand had been drilled. It is expected that considerable deeper objective drilling will be started in the Reed City field early in 1954—not only by Pure but also by Ohio Oil Co., Gulf Refining Co. and the several independents with producing leases in the pool.

CALIFORNIA

Fillmore Deep Test May be Discovery

Standard Oil Co. of California may have a deep condensate discovery at its wildcat northwest of Fillmore in Santa Clara Valley, Ventura County. The wildcat, 1 Sespe Ranch, reportedly flowed some condensate and several million cubic feet of gas on a formation test of a 60-ft. interval at the redrilled depth of 13,924 ft.

Located on the Sespe Ranch in SW SW 27-4n-20w, the test first was drilled to 14,503 ft. Hole then was plugged back to 13,100 ft. for redrilling. After making the formation test, hole was drilled to 14,000 ft. In order to make a second test of the prospective pay zone, hole was plugged back to about 11,000 ft. and a whipstock set for redrilling.

Glenn Gas Field Extended

General Petroleum Corp. 1 McGowan was completed as a new pool opener and extension to Beehive Bend gas field near Willows in Glenn County. Drilled to 5,257 ft. the wildcat was completed in a new Cretaceous sand below 5,021 ft., depth at which 5½-in. casing was set. The well, which is in 25-19n-2w and 1½ miles south of the field, tested at the rate of 1,450 and 5,150 M.c.f. daily through 11/64 and 22/64-in. chokes.

The field was opened last May by Sunray Oil Corp. 1 Estes, producing from a depth of 3,653-65 ft. In July, Sunray 1 Friesen opened a deeper pay at 4,497-4,549 ft. General Petroleum 1 McGowan tested at the rate of 4,000 M.c.f. at 3,648-50 ft., indicating the Estes pay was wide-spread, but this sand was plugged off for the time being.

Deep Yolo County Test

General Petroleum Corp. was nearing the 2,500-ft. mark at its 1 Glide-Court in Yolo County, 12 miles southwest of Sacramento. The wildcat is scheduled to drill to about 15,000 ft., making it one of the deepest tests ever planned for northern California. Location is in 10-7n-3e, approximately 8 miles northeast of the Dixon gas field.

Nevada-Arizona Activity

Shell Oil and Gulf Refining Co. have staked location for new wildcats in eastern Nevada. Shell 1 Unit will be drilled to approximately 6,000 ft. in the Eagle Springs area of Nye County, NE NW 35-9n-57e. Gulf Refining 1 Thousand Springs, a 6,500-ft. test, will be drilled in SE SW 8-40n-66e, in Elko County. The latter's 1 Wilkins Ranch, in 21-38n-61e, Elko County, was drilling below 4,690 ft. and in White Pine County, 20-26n-20e, Gulf Oil Co. 1 Dennison-Federal had cemented 6⅝-in. casing at 2,285 ft. In

Eureka County, Last Frontier Oil Co. was drilling below 570 ft. in 6-26n-51e.

Shell Oil Co. also was under way with a wildcat on the Navajo Indian Reservation in Apache County, northeast Arizona. Located in 6-41n-29e, the test, 1 Navajo, was drilling below 600 ft.

Ventura Discovery Finaled in Pliocene

Richfield Oil Corp. 1 Loel-Maxwell, 8 miles northeast of Santa Paula and 1 mile east of the Timber Canyon field, was completed flowing 300 bbl. of 37°-gravity crude from Pliocene sands at 7,856-8,560 ft. The wildcat had been drilled to 9,028 ft. but was plugged back to 8,560 ft. where 5-in. casing was set. Flow was through a 22/64-in. choke and contained an 8 per cent water cut. Location of the new discovery is in NW SE 18-4n-20w, Ventura County.

Sansinena Test Coring

Hearn Co. 1 Reilly, approximately ½ mile north of Sansinena field east of Los Angeles, may extend that field's productive limits. The wildcat reportedly encountered an oil sand at 3,450 ft. and was coring at that depth at last reports. Location is in NW NW 30-2s-10w, a short distance south of T. F. Vander Lann, Operator 1 Vander Lann, abandoned in December at 4,315 ft.

OKLAHOMA

Centrahoma Pool Has Excellent New Well

The deep development under way in Centrahoma pool in Coal County, southeastern Oklahoma, has paid off with another successful well at Carter Oil Co. 3 Thompson, NE NE NW 34-2n-9e.

The well flowed 167½ bbl. of oil in 4 hours on a ¾-in. choke. The 2 Thompson, NE NW NW 34-2n-9e, is drilling below 5,885 ft.

Third Well Being Added at North Jarvis

Union Oil Co. of California is adding the third well to new North Jarvis pool in Grant County, one of 1953's exploratory highlights.

The field's third well is 1 Conrady, NW NW SW 28-29n-6w. The well flowed an estimated 40 bbl. of oil hourly on drill-stem test at 5,237-52 ft. in the Simpson. A test at 5,272-85 ft. flowed 30 bbl. of oil hourly, estimated. Another test will be taken at 5,285-5,323 ft. The 1 Larson, SW SW NW 28-29n-6w, will be a north offset.

Logan Discovery Flows Oil on Drill-Stem Test

Hap Drilling Co. is completing a good well on the southeast side of 1952's East Guthrie Lake pool in Logan County. The 1 Kightlinger, NE NW NW 10-15n-2w, is running production test in the Layton sand perforated at 4,622-34 ft. A drill-stem test at 4,621-29 ft. flowed oil in 1 hour at the rate of 30 bbl. per hour.

The discovery well of the pool is Davidor & Davidor 1 Harned, NE SE SE 4. It was completed for a flow of 242 bbl. of oil per day from the Bartlesville sand.

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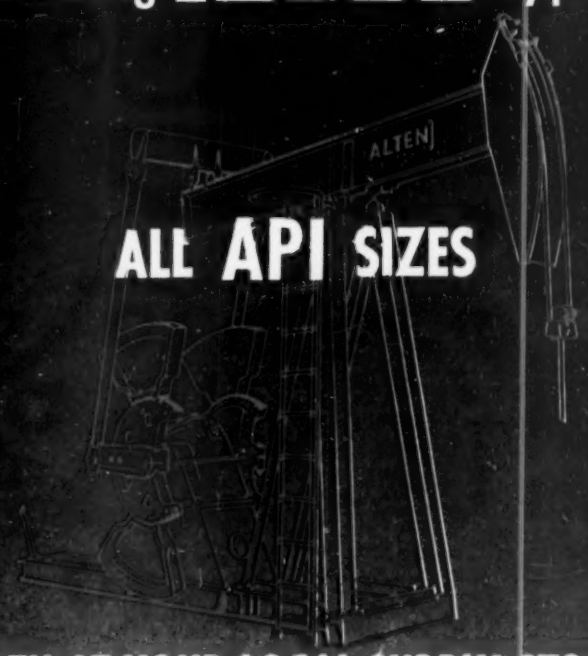

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TEXAS

WEST TEXAS

Upton Wildcat Indicates Flush Discovery

Field reports this week got the year off to a good start and indicated discoveries show promises of another banner year in the way of pre-Permian strikes.

Hunt Oil Co. 1 Velma Tippett Amacker, central Upton County, flowed oil at the rate of 104 bbl. hourly on its first drill-stem test in the Ellenburger. Nearest Ellenburger production is 4 miles to the northwest in Wilshire field.

Sample top on the Ellenburger was 11,950 ft. on elevation of 2,787 ft. The section tested was between 11,973-12,127 ft. Oil flowed within 14 minutes and was gaged at 104 bbl. an hour for 4 hours through 38/64-in. choke. On ¼-in. choke the well flowed 45 bbl. hourly.

Previously this well flowed oil on a drill-stem test in Wolfcamp limestone at 8,844-8,933 ft.

Andrews County . . . Continental Oil Co. 5 McCollum-Weibush, Ellenburger discovery in the Wemac-Wolfcamp field southeast of Andrews, has logged approximately 100 ft. of pay. Total depth was 13,416 ft. A 50-ft. core from 13,366-13,406 ft. had 40 ft. of porosity and bleeding oil and the bottom 10 ft. carried salt water. The hole was to be reamed and tested. Drill-stem tests of the Ellenburger have flowed oil up to 80 bbl. hourly.

The new Butler-Devonian pool in northeast Andrews County had one offset running structurally flat with the discovery and another slightly low. Plymouth Oil Co. 1 Butler, north offset to Glasco 1 Butler, was said to be running about flat to the discovery but first drill-stem test in the Devonian at 12,551-12,569 ft. developed mud with no shows. On sample top this well was correlated 15 ft. low to the discovery.

Deep Rock Oil Corp. 1 Newton, ½-mile east offset to the discovery, was last reported drilling at 12,104 ft. in shale and looking for the top of the Mississippian. It was said to be running low to the discovery.

Sutton County . . . Humble Oil & Refining Co. 1 North Branch Gas Unit, second well for the new gas field 20 miles northeast of Sonora, was reported 73 ft. high on the Strawn in relation to the discovery. An 8-hour test gave the well a calculated potential of 126,000,000 cu. ft. of dry gas daily. The field discovery, W. M. Lyle 1 Allison completed in 1952 for a flow of 5,000,000 cu. ft. daily plus 50 bbl. of distillate.

Pennsylvanian prospect . . . In southeastern Dawson County, Ray A. Albaugh 1-A Graves, previously drilled dry to 7,760 ft., developed a flow of oil on drill-stem test from 9,176-9,318 ft. Oil reached the top in 18 minutes and flowed an estimated 15 bbl. during the last 42 minutes of the test. Recovery in the pipe included 250 ft. of salt water.

Devonian prospect . . . In northwest Ector County Cities Service Oil Co. and others 1-J Cummins flowed oil on drill-stem test of the Devonian. The 2-hour test from 7,728-85 ft. had gas in 4 minutes and oil in 20, then gaged 94.7 bbl. of 48° oil in 2 hours. The well was started as an Ellenburger test and probably will be drilled ahead to that formation. Location is about 1 mile south of Devonian production in North Goldsmith field, about midway between Ellenburger wells in TXL and Andector fields but separated from both areas by dry holes.

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TEXAS PANHANDLE

Oil Indicated in Potter, Hansford Gasser Completed

In the northwest corner of Potter County, Sinclair Oil & Gas Co. A-108 Bivins estate, Section 17, Block O-18, flowed a total of 125 bbl. of oil by heads in 24 hours. The well was drilled by Colorado Interstate Gas Co. but turned to Sinclair when oil shows were found in granite wash below 3,200 ft. Another report credited the well with flowing 4 bbl. an hour from granite wash between 3,318-23 ft. Location is 1 mile southwest of gas production and 1 mile northwest of a small oil well drilled several years ago.

Hansford County . . . Humble Oil & Refining Co. 1 Jackson, 3½ miles north of Hansford, completed for a calculated open flow of 26,500,000 cu. ft. of gas a day from perforations in Douglas sand at 4,960-80 ft. Distillate yield was 12.6 bbl. in 13 hours.

NORTH TEXAS

Conglomerate Discovery Indicated for Montague

New conglomerate production for the area 3½ miles north of Montague was in prospect at Youngblood & Foree 1-A McCall, J. A. Morrow Survey. A drill-stem test from 6,121-34 ft. had flowing oil in 9 minutes, which was not gaged or estimated, and recovery in the pipe was oil with no water. Operators drilled ahead to 6,400 ft. and prepared to complete.

Southeast of Montague, Arnold H. Bruner 1 Greggory, W. S. Payne Survey, recovered 188 ft. of oil on a drill-stem test in the Strawn from 5,961-70 ft. Location is in the Kennedy field which produces from the Caddo.

Taylor County . . . A new Gray sand pool was opened 3 miles north of Goldsboro at French M. Robertson 1 Dorothy Griffin. Completion potential was 321 bbl. of oil a day through 34/64-in. choke, from pay at 3,878-86 ft. Top of pay was picked at 3,878 ft. on 1,867 ft. elevation.

Coleman County . . . Topshe & Crocket 1 J. E. Cox has opened new Gardner sand production 2½ miles east of Templeton field, and 1 mile northeast of Silver Valley. On completion test the well flowed 96 bbl. of oil daily through 14/64-in. choke, from perforations at 3,246-54 ft.

TEXAS GULF COAST

Oil Producer Completed In Nelsonville Gas Area

Oil production has been established in the Nelsonville area of Austin County with the completion by The Texas Co. of its 1 Hartman, good for 80 bbl. of 43°-gravity oil per day through 16/64-in. choke on potential gage. The well cut 8 per cent basic sediment and water.

Production is from a sand interval at 9,284-9,310 ft., which is shallower than the two other zones in the area from which gas-condensate production has been obtained. The field was discovered two years ago by Sun Oil Co.

Oil Production Indicated In Lavaca Bay Discovery

A new oil-discovery is indicated in Lavaca Bay, Calhoun County, where Sun Oil Co. is preparing to test showings encountered in its 1 State-Lavaca Bay Tract 34, a wildcat located 7 miles southeast of Port Lavaca.

Showings were in a sand interval at 8,696-8,728 ft., where a drill-stem test, using ¾-in. chokes, recovered 9 bbl. of clean oil plus 2 bbl. of oily mud, 50 per cent oil, with bottom-hole pressure of 3,895 psi.

Location is 2 miles northwest of a gas-distillate discovery well completed last March by Humble Oil & Refining Co. The latter well, 1 State-Tract 73, produced from sand at 8,570-90 ft.

SOUTHWEST TEXAS

Aransas County Wildcat Makes Good Oil Producer

Caroline Hunt Sands 1 Bauer et al, new oil-discovery well, 6 miles southeast of Austwell, in northeastern Aransas County, flowed 273.29 bbl. of 40.1°-gravity oil per day on potential gage through 7/64-in. choke. Flowing pressure on the tubing was 3,700 psi. Gas-oil ratio was 1,780 cu. ft. per barrel. No water was indicated. Production is from sand at 11,158-98 ft. (casing perforations) in hole drilled to 11,285 ft.

New Oil Area Opened In San Patricio Discovery

Renwar Oil Corp., of Corpus Christi, has a new oil-discovery at its 5 Hogg estate, 4 miles southeast of Ingleside, in San Patricio County. On a 2-hour gage through 10/64-

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in. choke, the well, testing with casing perforated at 7,954-58 ft., flowed at the rate of 203 bbl. of clean oil daily. Location is slightly more than a mile southwest of the same operator's 2 Hogg, another discovery well completed earlier this year.

Renwar has assurance of another good producer in the new Puerto Bay field, on the San Patricio-Aransas county line, where its 3 Maryland Trust Co. is testing a sand interval at 6,751-52 ft. A 45-minute drill-stem test through ¾-in. choke got fluid to the top in 13 minutes with 1,200-psi. pressure, and recovered 60 ft. of clean oil.

CANADA

New Discovery in Pembina Area Rounds Out Year

During the last week of December the western Canada explorers came through with another oil discovery horizon in the Pembina area of central west Alberta, rated oil success in the Cardium at a step-out test in that region, discovered Mississippian oil at a wildcat in southern Saskatchewan, and indicated probable oil extension at a venture in the Roselea area of southwest Manitoba.

The new Pembina producing horizon was found at the Socony-Seaboard-Merrill group's Violet Grove well which found oil in the basal Blairmore zone during drill-stem test at mid-week. This venture, located on LSD 2, 30-48-7w5, drill-stem tested from 6,522-62 ft. for 1 hour. Natural gas flowed in 3 minutes, at maximum rate 2,500,000 cu. ft. daily and gave up a recovery of 300 ft. of 42½°-gravity oil and 150 ft. of oil-cut mud, no water. The well is now heading down for test of Madison limestone prospects.

Now rated as a possible triple zoner oil success, this well had previously been chalked up as a Viking sand oil discovery and had also extended the Cardium sand production prospects. It lies 3½ miles northeast of Cardium sand oil wells in the southern sector of Pembina and is 4½ miles southeast of the northern oil production.

The step-out venture that found Cardium oil—also owned by the Socony-Seaboard-Merrill group—is 16-8 Drayton Valley, LSD 8, 16-49-7w5, 4¾ miles east-northeast of the team's 11-13 North Pembina discovery well. This well topped the Cardium over 140 ft. higher in elevation that the discovery, and flowed oil to the surface during initial drill-stem test in that pay formation.

Another Mississippian oil pool may be in the making in the Viewfield area of southern Saskatchewan, as Shell Oil Co.'s wildcat, 33 miles southeast of Weyburn and 29 miles north of Estevan recovered free oil during test this week.

This exploratory test, Shell 1-12 Viewfield, LSD 1, 12-7-9w2, 10 miles northeast of the company's Midale area oil wells drill-stem tested from 4,363-95 ft. for 45 minutes and gave up 120 ft. of clean gassy oil, 140 ft. of highly oil and gas-cut mud and 50 ft. of gassy mud—according to unofficial reports. String of production casing has been set, and production tests are expected to be commenced early during the new year.

Canadian Devonian Petroleums, Ltd., will start production testing at its indicated oil extension success at Roselea, 40 miles west of Brandon. This well, Canadian Devonian 1 Hepburn, LSD 16, 30-10-26w1, is 1¾ miles east-southeast of the flowing oil wells in Roselea oil pool.

First successful drill-stem test, from 2,011-29 ft., gave a recovery of 270 ft. of very gassy heavily oil-cut frothy mud, no water. A previous drill-stem test was not successfully completed, due to a mechanical failure during testing.

Indications are that commercial production will be possible from this well, but it will not definitely be known until further production tests have been carried out. String of casing was run over the weekend.

EASTERN CANADA

Gaspe . . . In the Gaspe Peninsula, Quebec Province, The 2 Bald Mountain, after recovering bailer and deepening to 6,170 ft. has shut down until weather conditions permit easier access.

On the Galt Brook dome, Continental 1 deep test at 3,235 ft. is shut down waiting for new sand pump. The asphalt base making some oil from an horizon at 1,196-1,202 ft. is cleaning out after a heavy shot at 2,053 ft.

The 1 Tar Point, making gas from 7,069 ft. is doing preliminary work preparatory to starting the casing and shut in job.

INDIANA

Calvert Drilling Co. has set casing after coring 15 ft. of oil saturated Cypress sand at 2,908-23 ft. at 1 Zola Shepard, 5-4s-10e, White County, 4 miles northwest of Crossville. This wildcat is 1½ miles from production.

In Wayne County Howje-Kim Oil Co. 1 Gregory heirs, 1-2s-8e, 5 miles due east of Fairfield, is being put on production tests after swabbing 6 bbl. of oil hourly from the Rosiclare at 3,308-13 ft. It is a 1-mile test.

APPALACHIAN AREA

WEST VIRGINIA

In Blue Sulphur district, Greenbrier County, West Virginia, Columbian Carbon Co. 1192 C. Witt McClung, wildcat is drilling at 3,889 ft., and 1193 W. E. Hedrick at 2,170 ft. Roaring Creek district, Randolph County, Edwin J. Fitzgerald et al 1 Paul King, is at 50 ft., Fox & Trimbie 1 J. T. & B. Brennan at 1,741 ft., and in Middle Fork district, Washington Natural Gas Co. 1 J. E. Hanifan et al, is shut down at 2,439 ft., Fifth sand 2,251-2,303 ft., show gas at 2,252 ft., Testing 29,000 cu. ft.

OHIO

A quarter-mile step-out in the northeast part of New Castle pool resulted in one of its best wells. Willard Shrider et al 7 H. L. Ringwalt, 3rd Qr., New Castle Township, Coshocton County, made 495 bbl. in 24 hours after fracturing Clinton sand, found at 3,300-3,364 ft.

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B. G. Davis et al have moved in on a second wildcat in Jackson Township, Coshocton County. The test is on E. and A. Swigert in Section 8.

PENNSYLVANIA

Interest in Pennsylvania is currently centered on Clearfield County, where two Oriskany tests, one an apparent discovery, were recently completed.

Reliable information indicates that Deemer's 2 Alice Irwin in Bell Township has been shot into a commercial gas well. The test was drilled through the Oriskany sandstone in an attempt to reach the Medina sandstone. Salt beds in the Upper Silurian prevented the test from reaching its objective and operator came up the hole and shot the Oriskany. Unconfirmed figures on the open flow indicate it to be 1,000,000 cu. ft. or more.

Oriskany top is 7,295 ft. (elev. 1,735). Test is located on Punxsutawney Quad. Section C about 11,000 ft. south of north line and 8,000 ft. west of east line.

In Pine Township Manufacturers Light & Heat Co. completed its 1 State of Pennsylvania (Tract C) as a dry hole. This test is 2½ miles northeast of two recently completed dry tests on the Chestnut Ridge anticline. Most recent test had a thicker Oriskany section than earlier tests and a show of gas.

Oriskany top is 7,078 (elevation 2,137) and location is on Penfield Quad. Section E 11,500 ft. north of south line and 1,000 ft. west of east line.

The next scheduled completion on the Chestnut Ridge anticline in Clearfield County is 1 Hicks located 8 miles northeast of 1 State of Pennsylvania in the direction of Benezette field.

NEW MEXICO

SOUTHEAST NEW MEXICO

Eidson Outpost Running Low on Devonian

Western Natural Gas Co. 2 Ramco-State, ½-mile southeast of the same company's 1 Millard Eidson, Devonian discovery northwest of Lovington fields in Lea County, developed 10 ft. of heavily oil and gas-cut mud on a test of the Devonian from 12,710-12,742 ft.

The 2 Ramco-State had top of the Devonian at minus 8,870 ft. compared with minus 8,503 ft. in the discovery.

East of Denton field, Argo Oil Co. 1 Tomlinson reported sample top on the Mississippian lime at 11,806 ft. and was drilling ahead below 11,815 ft.

Continental Oil Co. 5 Anderson Ranch, 11-16s-32e, has been completed for 308 bbl. of oil a day from pay at 9,742-9,884 ft. The well extends Wolfcamp pay in Anderson Ranch field ½ mile south.

ILLINOIS

Five New Oil Pools In Illinois

Five oil pools were discovered in Illinois in December, according to the State Geological Survey.

These were: Toliver South in Clay County, North City in Franklin County, and Trumbull West in White County; all producing from the Aux Vases sandstone. Locust Grove South in Wayne County producing from the

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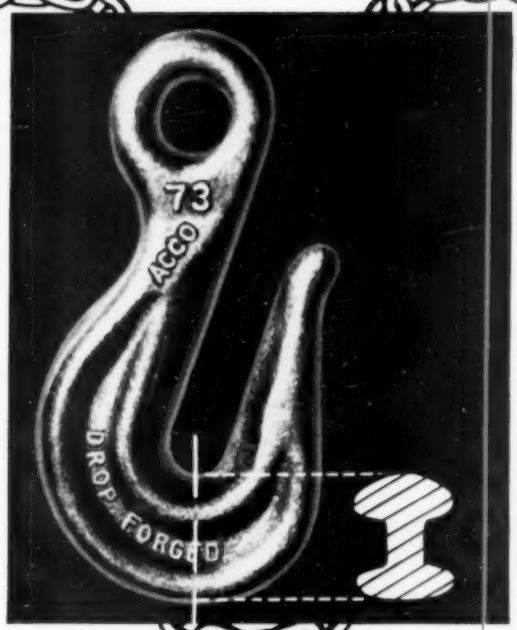

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Rosiclare limestone, and Prentice in Morgan County producing from a Pennsylvanian sandstone.

Extensions were completed to six pools: Warrenton-Borton in Edgar County, Evers in Effingham County, Seaser in Franklin County, Assumption Consolidated in Christian County, Clay City Consolidated in Wayne County, and Prentice in Morgan County (gas well in an oil pool). The Aux Vases sandstone was opened up as a new pay in the Sesser pool.

WILDCAT COMPLETIONS

SOUTHWEST TEXAS

Aransas County: Caroline Hunt Sands 1 Bauer et al, Thomas Newcomb Sur., A-165. IP 273.29 BOPD, 7/64-in., 40.1°, casing perforations 11,158-98 ft. TD 11,285 ft. (New field.)

Brooks County: Monterey Exploration Co. 1 Hinojosa, El Tule Sur., A-257. Dry. TD 6,857 ft.

Frio County: C. G. Dunwoody, Jr., 1 Carter, BS&F Sur. 1, A-94. Dry. TD 4,641 ft.

Guadalupe County: W. A. Mills and Leslie Blackmon 1 Bormann, J. B. Cowan Sur. Shut down. TD 2,170 ft.

Hidalgo County: Adams & Haggarty 1 Guerra Brothers, San Salvador del Tule Grant, Tract 86. Dry. TD 9,039 ft.

Houston Oil Co. and American Republics Corp. 6 West, Porcion 73. IP 40.02 BOPD, ⅛-in., 60°, Mission sand 5,766-70 ft. (casing perforations). TD 6,257 ft. (New pay in Tabasco field.)

Jim Hogg County: Jake L. Hamon and Edwin L. Cox 1 Guerra, Lot 26, Carlos G. Guerra Subd., Las Cuevitas Grant. Dry. TD 2,363 ft.

Jim Wells County: Calvert & Manley 2 Burns, J. Almond Sur. 8. Dry. TD 5,330 ft.

Guy E. Chapman et al 1 Updegraph, Section 22, R. P. Haldeman Subd., San Francisco Grant. Dry. TD 7,210 ft.

San Patricio County: C. G. Glasscock 1 Cunningham, Section 57, George H. Paul Subd., Coleman-Fulton Pasture. Dry. TD 9,500 ft.

Kirkwood & Co. 1-B Bewing, Section 24, George H. Paul Subd., Coleman-Fulton Pasture. Dry. TD 8,487 ft.

Travis County: Jack Clark 1 Benastone, T. Smith Sur. Dry. TD 687 ft.

H. J. Steward 1 Welander, Pedro Rodriguez Sur. 66. Dry. TD 1,220 ft.

Webb County: Lloyd S. Parker et al 1 Nicholson, C&M Sur. 1523. Dry. TD 3,575 ft.

Killam & Hurd 1 Bruni estate, C&M Sur. 451. Dry. TD 3,142 ft.

Wilson County: F. B. Cochran, Jr., 1 Jarzombek, George Davis Sur. 12, A-92. Dry. TD 5,175 ft.

TEXAS GULF COAST

Bee County: Dudley T. Dougherty 1 McCurdy, Maximo Gomez Sur., A-20. Dry. TD 5,775 ft.

Brazoria County: J. S. Michael 1 Stephens et al, Ames Pollard Sur., A-359. Dry. TD 8,800 ft.

Southern Minerals Corp. 1 Adams, J. S. Talmage Sur. 76, A-562. Dry. TD 7,815 ft.

Goliad County: Kirkwood & Morgan, Inc., 2 Jessie Power heirs, William Lavery Sur., A-80. Dry. TD 4,416 ft.

Paul E. Dougherty et al 1 Hall, James T. Kilgore Sur., A-172. Dry. TD 4,250 ft.

Galveston County: Earl C. Hankamer et al 1 Gilbert et al, Elijah Franks Sur., A-64. Dry. TD 9,200 ft.

Harris County: Texas State Drilling Co. 1 Simmons, D. D. Culp Sur., A-809. IP 2,706 M.c.f. daily with 20 BC per M.M.c.f., 12/64-in. TD 9,150 ft. (New pay in Rankin field.)

Jefferson County: D. D. Feldman Oil & Gas Co. 1 Quinn, L. B. Pipkin Sur. 262, A-525. Dry. TD 11,520 ft.

Madison County: Panuco Oil Leases, Inc., 1 Forrest, Samuel Larry Sur. (Fort Trinidad area). Dry. TD 9,360 ft.

Matagorda County: J. M. Flaitz and R. B. Mitchell 3 Pierce, Sec. 7, I&GN Sur., A-250. Dry. TD 7,500 ft.

Victoria County: Taylor Oil & Gas Co. 1 McCan et al, S. A. Belding Sur., A-142. Dry. TD 4,253 ft.

Wharton County: Patrick W. Brady 1 Mauk, Sec. 58, E. L. Wilson Sur., A-565. Dry. TD 6,814 ft.

E. J. Hudson 1 Pierce, Robert Kuykendall Lge., A-29. Dry. TD 6,014 ft.

EAST TEXAS

Cherokee County: Striker Oil Co. 2 O'Connell, F. J. Vallanova Sur., A-52. Dry. TD 3,892 ft.

Limestone County: Lyle Cashion Co. 1 Finch, Sarah McAnulty Sur., A-19. Dry. TD 3,500 ft.

Red River County: C. A. Lee 1 Martin Stiles, Joseph Wagley Sur. Dry. TD 5,007 ft.

WEST CENTRAL TEXAS

Brown County: Hickok & Reynolds Royalty Co. 1-A Chambers, Blk. 12, White Sur. 161. Dry. TD 3,317 ft.

Coleman County: E. C. Mahoney 1 Evans, Sec. 48, T&NO Sur. Dry. TD 2,615 ft.

Fisher County: Gore Drilling Co. 1 Washam, 13-20-T&P. Dry. TD 5,880 ft.

Round Top Oil Co. 1 Collins, 40-Y-T&P. Dry. TD 6,515 ft.

Jones County: Robinson-Puckett and Ameri-

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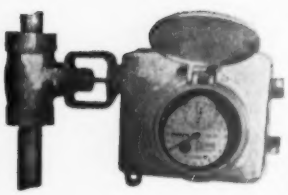

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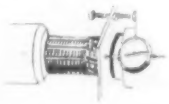
Hardenability tests are made and form the basis for the "tailored" heat treatment of tool joints made from different heats of steel.

Precision machining is accomplished by specially designed automatic machines.



Jigs and fixtures of the highest precision assure perfect alignment and concentricity of **REED** Tool Joints.

Thread comparator checks hob used to cut **REED** Tool Joint threads, assuring accuracy of thread form, lead and taper.

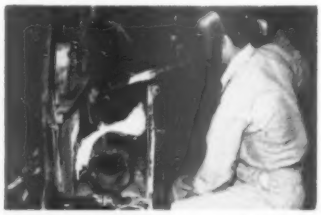
Automatic heat treating furnaces—especially designed for the job—heat tool joints to utmost precision in a carefully controlled atmosphere.

This central control room enables the heat treat foreman to "tailor" the treatment of each heat of steel to extreme accuracy.

Precision quenching and drawing complete the "tailored" heat treatment that gives the best combination of strength and toughness to every tool joint.

Hardness testing is final assurance that every **REED** Tool Joint is strong and tough.

Tool joint threads are treated to prevent galling during breaking-in. Complex metal phosphate coating acts as a pre-lubricant infused into the threads.



"Reedite" hard facing—available on order—is factory applied to resist abrasion better and make tool joints last longer.

These hand gauges, plus comparators, master gauges, profilimeters, magnaflux and other machines, are used to make the 120 inspections each tool joint must pass.

REED ROLLER BIT COMPANY

HOUSTON 1, TEXAS

WILDCAT COMPLETIONS

can Liberty Oil Co. 1-A Lynn, 42-1-BBB&C. Dry. TD 2,875 ft.

Stonewall County: Pan-American Production Co. 1 Martin, Sec. 10, T&P Sur. Dry. TD 6,503 ft.

P. R. Rutherford 2-A Baldwin, 49-D-H&TC. Dry. TD 6,223 ft.

Taylor County: Sid Katz Exploration Co. 1 Benton, Sec. 45, LAL Sur. Dry. TD 4,810 ft. Ellenburger 4,797 ft.

Leon-Fleming-Dunlap 1 Pinkley, J. A. Nabors Sur. 10 Dry. TD 2,905 ft.

Throckmorton County: Kingwood Oil Co. 1 Wright, Sec. 256, BBB&C Sur. IPP 105.8 BOPD, 40°, pay 4,414 ft. TD 4,418 ft.

NORTH TEXAS

Archer County: C. B. Christie 1 Earl Bearden, J. Riley Sur., Blk. 3, A-364. IPP 35 BOPD, 41°, Caddo 4,615 ft. TD 5,286 ft.

G. E. Kadane & Sons 2 Wilson-Heirs-Ohio, M. Hutchinson Sur., A-172. Dry. TD 1,300 ft.

Baylor County: Olin Calvin 1 Mills, TE&L Sur. 2414. Dry. TD 1,418 ft.

Olin Calvin 2 Mills, TE&L Sur. 2414. Dry. TD 1,417 ft.

Crown Central Petroleum Corp. 1 Mrs. Minnie Head, HT&B Sur. Dry. TD 5,360 ft.

Y-B Drilling Co. 2-B Burrel Mills, TE&L Sur. 2413. IPP 44 BOPD, pay 1,379 ft. TD 1,410 ft.

Clay County: L. T. Burns 1-B Lyles, San Augustine University Sur., A-403. Dry. TD 4,575 ft.

Cooke County: Ralph H. Snuggs 1 Davis, J. D. Banton Sur., A-85. Dry. TD 4,885 ft.

Grayson County: Sam Lett 1 Umphress, J. R. Smith Sur., A-1129. Dry. TD 6,015 ft.

Star Oil Co. 1 Whisenant, W. S. Thompson Sur., A-1207. Dry. TD 7,814 ft.

Superior Oil Co. 1 Shelton, Antonio Hernandez Sur., A-488. Dry. TD 7,344 ft.

Jack County: Walter Plemons Production Co. 1 Moreland, Wm. McDonald Sur., A-378. Dry. TD 3,525 ft.

Warren Petroleum Corp. 1 Bowen, Rebecca Parker Sur., A-461. Dry. TD 4,011 ft.

Knox County: Sid Katz Exploration Co. 1 Davis & Gauss, D. G. Burnett Sur. 19. Dry. TD 5,860 ft., Caddo 5,595 ft.

Montague County: P. C. Bundy and H. B. Pyle 1 Ayers, Thomas Berryhill Sur., A-42. Dry. TD 3,394 ft.

Star Oil Co. 1 Fooshee, Blk. 13, ETRR Sur., A-276. Dry. TD 6,534 ft.

Wichita County: W. R. Baker 1 Robinson Bros., Blk. 305, Waggoner Colony Subd. Dry. TD 450 ft.

Wilbarger County: F. J. Pounds 1-I. Pounds-Waggoner, 14-13-H&TC. Dry. TD 2,000 ft.

Wise County: E. B. Clark 1 Blocker, Sec. 10, Falls CSL Sur. Dry. TD 4,684 ft.

Young County: Ada Oil Co. 1 Craig, D. Kramer Sur., A-1475. Dry. TD 3,868 ft.

Ada Oil 1 Young, Ses. 4, BBB&C Sur., A-28. Dry. TD 3,101 ft.

Joe K. Bailey 1 Baker, TE&L Sur. 2787. Dry. TD 3,558 ft.

Fortex Oil Co. 1 Jeffery, Blk. TE&L Sur. Dry. TD 893 ft.

Ted A. Norwood and Signal Oil & Gas Co. 1 Smith, TE&L Sur. 3407, A-1227. IP BOPD, 20/64-in., 40°, sand pay 3,069 ft. TD 3,572 ft.

Woodson Oil Co. 1 Roach, TE&L Sur. 1596. IPP 336 BOPD, 10/64-in., Mississippian 5,007 ft. TD 5,019 ft.

Don Woody 1 Burnett, TE&L Sur. 1117. Dry. TD 2,603 ft.

WEST TEXAS

Crockett County: Cataroga Oil Co. 1 Ingham-Superior, 37-1-I&GN. Dry. TD 1,338 ft.

James H. Snowden 1 Ozona-Barnhart Tray Co., 10-OP-GC&SF. Dry. TD 1,500 ft.

Dawson County: Chambers & Kennedy 1-A Cox, 19-34-T5N-T&P. Dry. TD 8,807 ft. Elev. 2,933 ft., Wolfcamp 8,001 ft.

Gaines County: O. D. Alsabrook 1 T. S. Riley, 411-G-CCSD&RGNG. IP 361 BOPD, 3/8-in., 38°, Wolfcamp pay 9,125 ft.; IP 681 BOPD, 1/2-in., 40°, Devonian pay 11,135 ft. TD 11,185 ft. Dual completion.

Irion County: Wohlreich & Heftler 1 Abe Mayer, TCRR Sur. 1129, A-608. Dry. TD 815 ft.

King County: A. O. Wellman & Sons and Texas Crude Oil Co. 1 Pitchfork Ranch, Wm. Cain Sur. Dry. TD 4,766 ft. Elev. 1,956 ft., reef 4,680 ft.

Midland County: Rowan Drilling Co. and Cosden Petroleum Corp. 1 Roy Parks, 44-41-T2S-T&P. Dry. TD 11,100 ft. Elev. 2,822 ft., Strawn 10,946 ft., Bend 10,925 ft.

Superior Oil Co. 1-44 Willis, 44-A-G. G. Gray Sur. Dry. TD 12,312 ft. Elev. 2,721 ft., Strawn 10,390 ft., Devonian 11,490 ft., Ellenburger 12,471 ft.

Vickers Exploration, Ltd. 1 Roy Parks, 2-41-T3S-T&P. Dry. TD 12,351 ft. Elev. 2,817 ft., Strawn 10,500 ft.

Pecos County: Continental Oil Co. 1 Lynch, 70-OW-C. M. Foster Sur. 70. Dry. TD 6,055 ft.

Superior Oil Co. 1-45 Roy McDonald, 45-12-H&GN. Dry. TD 2,981 ft.

Reagan County: Sun Oil Co. 1 John R. Scott,

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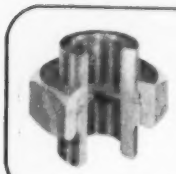

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WILDCAT COMPLETIONS

174-1-T&P. IPP 14 BOPD, 36°, pay 2,543 ft. TD 2,796 ft.

Runnels County: James K. Anderson 1 Wood, Sec. 530½, W. H. Dunn Sur. Dry. TD 2,609 ft.

Walter Duncan 1 Caudle, John Brown Sur. 528. IP 70.8 BOPD, 16/64-in., 40°, pay 2,601 ft. TD 2,605 ft.

Schleicher County: Curtis Thomas 1 Mathews, 87-1A-HE&WT. Dry. TD 600 ft.

Sterling County: J. M. Hawkins, trustee 1 J. L. Glass, 2-31-T5S-T&P. IPP 58 BOPD, 31°, pay 1,454 ft. TD 1,475 ft.

Tom Green County: Conkling Bros. 1 West, 51-25-H&TC. Dry. TD 6,002 ft. Elev. 2,297 ft., Strawn 5,388 ft., Ellenburger 5,800 ft.

Upton County: Falcon Oil Corp. 1 Cities Service Oil Co., 1-W-GC&SF. Dry. TD 2,070 ft.

Vickers Exploration Co. 1 Powell, 19-40-T5S-T&P. Dry. TD 11,322 ft. Elev. 2,841 ft., Pennsylvanian 10,507 ft.

Yoakum County: R. H. Fulton 1 Keller, Sec. 399, Blk. D., J. H. Gibson Sur. Dry. TD 12,000 ft. Elev. 3,776 ft., Pennsylvanian 9,800 ft., Devonian 11,945 ft.

ILLINOIS

Clay County: Calvert Drilling Co. 1 Iffert, SW SW SE 34-5n-8e. Dry. TD 3,135 ft.

Fayette County: J. W. Mioux 1 Hayes, SW NE SE 24-4n-1w. Dry. TD 1,496 ft.

L. E. Bailey 1 Wasser, NE NE NE 5-6n-2e. Dry. TD 2,044 ft.

MICHIGAN

Arenac County: Mason E. Holloway 1 Kentgens, SW NW SE 23-19n-4e. IPP 8 to 10 bbl. from Richfield pay 4,115-25 ft. TD 4,177 ft. (New pay in Deep River field.)

Clare County: Don Rayburn 1 Meyer, N½ NE SE 25-20n-3w. IPF 50 BOPH from Richfield pay. TD 5,269 ft. (New pay in Skeels field.)

Gratiot County: The Moco 1 Potter, SW SE NE 11-11n-4w. estimated 7 to 10 BOPD (natural and preliminary), Traverse 2,783 ft., 2,853-71 ft. TD 2,871 ft. (New pool.)

Osceola County: Americrude Oil Co. 1 Oeverman & Johnson heirs, NE NW NE 18-20n-8w. Dry. TD 4,333 ft. in Dundee and Reed City zones.

St. Clair County: C. F. Parkinson 1 Schneider, C SE 18-5n-17e. 3.5 M.c.f. daily from basal Salina-Niagaran. TD 2,574 ft. (New pool.)

Van Buren County: Ford Oil Co. 1 Wickett, SE SE SW 26-4s-14w. Dry. TD 1,138 ft. in Traverse lime.

Ford Henry 1 Szabronowski, NW NW NW 36-2s-14w. Dry. TD 1,145 ft. in Traverse lime.

Washtenaw County: W. C. Taggart 3 Curtis, W½ SW SW 28-4s-4e. IPF 40 BOPH, from Traverse or Dundee pay 1,030 ft. TD approximately 1,120 ft. (New pool.)

OHIO

Licking County: Waverly Oil Works Co. 1 Frank Kreager, Lot 7, Madison Township. IP 902 M.c.f. daily, Newburg 2,120-2,130 ft., TD 2,130 ft. New pay in Newark field.

PENNSYLVANIA

Clearfield County: Manufacturers Light & Heat Co. 1 State of Pennsylvania (Tract C), Penfield Quad., Sec. E, 11,500 ft. north of south line and 1,000 ft. west of east line. Dry. TD 7,094 ft. in Oriskany sand.

Deemer 2 Alice Irwin, Punxsutawney Quad., Sec. C, approx. 11,000 ft. south

Automatic Firing Controls for Oil or Gas

Users of steam will be glad to know Inferno Firing Controls operate efficiently for either oil or gas. Regardless of where you move, you can take advantage of the cheaper fuel when your boilers are equipped with Inferno Firing Controls. Write today for complete information. Ask for a FREE copy of Bulletin 8-B.

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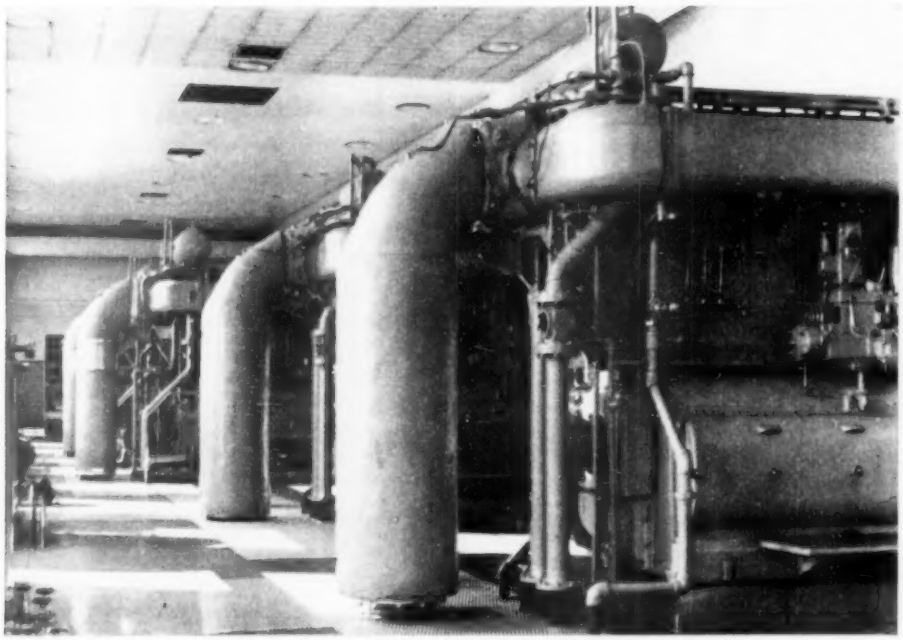

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Koppers Conformable Ring maintains constant unit pressure for positive oil control. Conforms readily to meet cylinder distortion because flexible cast iron member is pressed outward by abutment type spring which exerts uniform radial pressure around entire circumference.

*Van der Horst Process

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Prior to using Koppers Conformable Oil Rings, a pipe line company reported average oil consumption as approximately 3500 to 4000 horsepower hours per gallon. Now they are getting 2 to 3 times that much.

In addition to this large saving in oil consumption, they find they get longer periods of satisfactory operation between overhauls.

As a result, this pipe line company has adopted Koppers Piston Rings as standard equipment on all their 12½" x 13" turbo-charged engines.

Does this suggest possible savings in your operation? Less oil consumption? Less down time, lower labor costs? Then investigate Koppers Porous Chrome* and Conformable Oil Rings. And install them next time you have a piston ring replacement job.

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WILDCAT COMPLETIONS

of north line and 8,000 ft. west of east line. IP 1 M.M.c.f. of gas per day, Oriskany sand 7,295 ft. TD 7,840 ft.

Potter County: J. H. Isherwood, Jr. 1 Van Sickle, Gaines Quad., Sec. D, 3,200 ft. south of north line and 11,900 ft. west of east line. Dry. TD 5,671 ft. in Oriskany sand.

ALABAMA

Covington County: Daws-Stanley and Lyle Cashion Co. 1 Dixon, C SW SW 22-3n-15e. Dry. TD 4,390 ft. Elev. 267 ft., lower Tuscaloosa 4,336 ft.

MISSISSIPPI

Franklin County: H. L. Rowley 1 Anderson, 18-5n-1e. Dry. TD 7,005 ft. Elev. 177 ft. Wilcox 4,442 ft., base Baker shale 6,254 ft., Minter sand 6,520 ft.

SOUTH LOUISIANA

Acadia Parish: Continental Oil Co. 1 Petitjean, 47-9s-2e. IP 618 BOPD, 12/64-in., 43.6°, casing perforations 11,905-20 ft. TD 12,766 ft. (New field—North Rayne.)

Beauregard Parish: Vincent & Welch, Inc., 1 Walker, 24-5s-7w. IP 1,470 M.c.f. daily with spray of distillate, 12/64-in., casing perforations 5,003-05 ft. TD 9,204 ft. (New field.)

Cameron Parish: Magnolia Petroleum Co. 1-C Sweet Lake, 31-12s-7w. Dry. TD 10,500 ft.

St. Mary Parish: Southern Natural Gas Co. 2 Placito Tamporello, 37-15s-9e. IP 432 BOPD, 16/64-in., 30°, casing perforations 11,901-919 ft. TD 11,940 ft. (New pay in Franklin field—first oil production.)

NORTH LOUISIANA

Claiborne Parish: T. L. James & Co. 1 Moon, near C NE SW 30-22n-5w. Dry. TD 5,426 ft.

ARKANSAS

Lafayette County: Interstate Natural Gas Co. 1 Olin-IPCO, C NW SW SE 22-19s-24w. Dry. TD 3,167 ft.

H. T. Pannell 1 Nix, C SE NW SE 11-16s-23w. Dry. TD 2,510 ft.

Miller County: Sinclair Oil & Gas Co. 1 Nelson, 150 ft. E of C SW NE 7-20s-26w. IPF 336 BOPD, Gloyd 6,108-16 ft., 43°, ¼-in. TD 7,313 ft. (Opens Kiblah pool.)

James G. Brown et al 1 Doots, C NE NE 7-19s-27w. Dry. TD 7,136 ft.

KANSAS

Barber County: Westpan Hydrocarbon 2 Pelton, SE NW NW 34-32s-10w. Dry. TD 4,740 ft.

Butler County: Buffalo Oil 1 Wilson, NE NW NE 17-25s-4e. Dry. TD 2,980 ft.

Stelbar 2 Stolebarger, SE NW NW 26-29s-4e. IPP 25 BOPD, Bartlesville 2,762-74 ft. TD 2,774 ft. (Oil discovery.)

Cowley County: K. T. Weideman 1 Shane, NE NE SW 1-33s-3e. IPP 10 BOPD, Bartlesville 3,260-75 ft. TD 3,275 ft. (Oil discovery.)

Ellis County: Murfin and Finston 1 Kreutzer, SE SW NW 5-12s-18w. Dry. TD 3,695 ft.

Marion County: Anderson-Prichard Oil Corp. 1 Riesen, NE NE NE 11-19s-2e. Dry. TD 2,909 ft. Franco-Central 1 Siebert, SW SW NW 36-19s-3e. Dry. TD 2,666 ft.

Norton County: Jones, Shelburne & Farmer 1 City of Norton, NE NE SE 27-2s-23w. Dry. TD 3,730 ft.

Pratt County: Musgrove Petroleum 1 Moon, NE NE SE 20-27s-13w. Dry. TD 4,597 ft.

Sedgwick County: J. P. Gaty 1 DeLong, NE NE SE 35-25s-2e. Dry. TD 3,220 ft.

Stafford County: Natural Gas & Oil and Oklahoma Exploration 1 Tanner, SE NW NE 7-23s-14w. Dry. TD 4,110 ft.

Sumner County: Anderson-Prichard 1 Hoffman, NW SW SW 27-34s-1e. Dry. TD 4,067 ft.

Thomas County: Natural Gas & Oil Co. 1 Drew, SE SE NW 25-7s-31w. Dry. TD 4,643 ft.

CALIFORNIA

Colusa County: R. S. Rheem, Oper. 1 Gomes, 25-18-2w. Dry. TD 3,020 ft.

Fresno County: Russell Giffen 81-16F, 16-20s-16e. Dry. TD 10,184 ft.

Long, Mizel & Associates 1-3 Properties Inc., 3-15s-18e. Dry. TD 5,500 ft.

Kern County: Bankline Oil Co. 28 Plank Comm., SW SW 29-29s-27e, IP 180 BOPD, 18.5° gravity, 60 per cent cut, perfs. 4,565-4,690 ft., TD 7,397 ft. (New Chanac sand, Pliocene, discovery 1 mile southwest of Fruitvale field).

L. L. Hillman 2 Hillman-Roos, 11-29s-28e. Dry. TD 1,536 ft.

Reserve Oil & Gas Co. 44-17 Reserve-Butler, 17-11n-19w. Dry. TD 8,550 ft.

Richfield Oil Corp. 1 Ramsey, 22-10n-23w. Dry. TD 3,912 ft.

Union Oil Co. 48-8 Hudson, 8-10n-23w. Dry. TD 4,201 ft.

San Benito County: Strata Oil Co. 1 Strata, 19-16s-11e. Dry. TD 950 ft.

Tide Water Associated Oil Co. 1 Breen, 19-12s-5e. Dry. TD 4,591 ft.

San Luis Obispo County: General Petroleum Corp. 1 Ballinger Canyon unit, 31-10n-24w. Dry. TD 11,981 ft.

Santa Barbara County: C. J. Gibson 1 Goerhing, 23-10n-26w. Dry. TD 7,601 ft.

Richfield Oil Corp. 55-22 Russell-A, 22-10n-27w. Dry. TD 6,097 ft.

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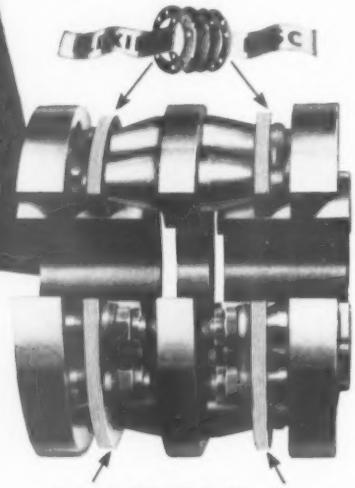

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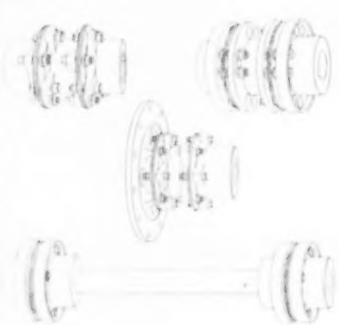

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WILDCAT COMPLETIONS

Santa Clara County: Union Oil Co. 1 Waugaman, 27-11s-3e. Dry. TD 6,426 ft.

Ventura County: Macson Oil Co. 1 Strathearn, SW SE 6-2n-18w, IPP 45 BOPD, 32° gravity, 60 per cent cut, perfs. 281-611 ft., Eocene 216 ft., Sespe fault 2,380 ft., TD 2,828 ft., PB 665 ft. (New Eocene sand discovery 1½ miles southwest of Simi field.)

R. S. Rheem, Operator 1 Social-Lariman, 24-4n-18w. Dry. TD 7,728 ft.

Richfield Oil Corp. 1 Maxwell-Loel, NW SE 18-4n-20w, IPF 300 BPD, 37° gravity, 8 per cent cut, perfs. 7,856-8,560 ft., TD 9,028 ft. (New Pliocene sand discovery 1 mile east of Timber Canyon field.)

Union Oil Co. 24 Simi, 28-3n-17w. Dry. TD 5,177 ft.

NORTH DAKOTA

Cavalier County: Los Nietos 1 John Berge, NW SW 3-159n-63w. Dry. TD 1,464 ft. Los Nietos 1 Theodore Stinkowey, NW NE 31-159n-63w. Dry. TD 1,297 ft.

McKenzie County, W. Sanish area: Stanolind Oil & Gas Co. 1 Woodrow Star-Tribal, C SW SE 21-152n-94w, IP 550 BOPD 12 64-in. choke, Devonian discovery—new field. Interlake 12,110 ft. TD 12,360 ft.

Williams County, South Beaver Lodge: Amerada Petroleum 1 N. Dakota "E," C NW NW 36-155n-96w, IPF 616 BOPD, 15 64-in. choke, Madison discovery—new field. Madison 8,117 ft. TD 8,467 ft.

WYOMING

Hot Springs County, Hamilton Dome: Argo Oil Corp. 51 Government, C SE SE 14-44n-98w, IPP 384 BO & 109 BWPD, Big Horn Dolomite Discovery—new pay. Pre-Cambrian 4,902 ft. TD 4,929 ft. PB 3,542 ft.

Weston County, Cheyenne River: Art Schlaikjer 1 Dixon, SW SW SW 7-41n-65w. Dry. TD 7,146 ft. Newcastle 7,035 ft.

COLORADO

Logan County: Shell Oil Co. 1 Applehans, C NW NW 22-10n-53w. Dry. TD 5,045 ft. "J" sand 4,974 ft.

Rio Blanco County: S. W. McLaughlin 2 Jacobs, SE SW SW 1-1n-97w. Temporarily suspended. TD 4,428 ft. Mesaverde 3,666 ft.

White River: S. W. McLaughlin 1-"A" W. H. Jacobs, C SE NE 2-1n-97w. Dry. TD 200 ft.

Rangeley: S. W. McLaughlin 2-D Fee, NW NW NE 32-2n-102w. Dry. TD 2,992 ft.

Washington County: Kerr-Braden & Hoover 1 Wilson, NE NE NE 18-3s-53w. Dry. Skull Creek 4,937 ft. TD 4,939 ft.

EQUIPMENT MEN

Peters Completes Field Trip Through Mid-Continent

H. H. PETERS

H. H. (Pete) Peters, president, Technical Oil Tool Corp., recently returned from a 2-month field trip through the Mid-Continent area. During this time, Peters and E. G. McConnell, vice president and Mid-Continent manager for Totco, conducted a series of meetings with Totco service representatives. Discussing ways and means of improving customer service, the Totco executives held sessions in Oklahoma City, Houston, and Odessa, Tex.

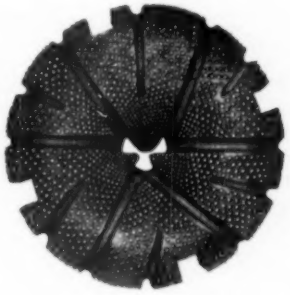
At each of these meetings, special emphasis was placed on determination of practical methods of expediting customer requirements in the local area. Each of Totco's 28 service representatives in the Mid-Continent area attended one of the meetings.

Alco Announces Changes In Sales Organization

An organizational change has been announced by American Locomotive Co.

W. S. Morris, executive vice president of Alco, announced from New

the answer to many of your drilling problems



TRUCO CONCAVE DRILLING BITS

When you're making hole too slow and making trips too often it's time to consult your nearest D & S Field Engineer about Truco Concave Drilling Bits. Trucos do the job faster at less cost per foot.

DRILLING & SERVICE
3031 Elm Street
Dallas 1, Texas

TRUCO DIAMOND BITS AND D & S CORE BARRELS

York that A. T. Lawrance has been appointed regional sales manager for the Alco Products Division with headquarters in Houston. At the same time, W. L. Larson, general plant manager of Alco's Dunkirk plant and of Beaumont Iron Works Co., said that Charles H. Homer, Jr., has been named manager of Beaumont Iron Works plant.

Lawrance has been both southwestern sales manager and manager of Beaumont Iron Works. Separation of the two functions will enable Lawrance to devote full time to supervising increased sales of both Alco products and Beaumont Iron Works through various sales offices in the southwest.

In his new capacity Lawrance will supervise sales of the Alco products line of industrial equipment as well as the Beaumont line of oil-field products in a sales territory extending from the Mississippi to the West Coast and north to Oklahoma.

Homer will be in charge of all manufacturing of Beaumont Iron Works Co., and in addition will be responsible for purchasing, accounting, and industrial-relations functions.

Homer graduated from Rice Institute in 1937 with a degree in chemical engineering. He joined Beaumont in 1938 as a metallurgist and became plant superintendent in 1947. Two years later, he was transferred to Dunkirk, N. Y., as chief of quality control engineering for Alco products division. He returned to Beaumont in 1952 as product manager of heat-transfer equipment.

C. E. Buchan Made E-M General Sales Manager

C. E. BUCHAN

The appointment of C. E. Buchan to the newly created position of general sales manager has been announced by A. P. Burris, vice president in charge of sales of Electric Machinery Manufacturing Co., Minneapolis.

Buchan has been the Cleveland district manager for the past 25 years. He will be in direct charge of the activities of the company's 49 domestic American offices, as well as foreign representatives.

His successor as Cleveland district manager will be J. J. Wall, for the past 4 years a sales engineer in the New York district office.

Supervisory Changes Announced by Lane-Wells

Several supervisory and operative changes have recently been made by Lane-Wells Co. in the Mid-Continent division, according to Rodney S. Durkee, president.

S. R. Pittman, formerly district sales engineer at Williston, N. D., has been appointed district sales engineer at Healdton, Okla.

Charles L. Naus, formerly station superintendent at Glendive, Mont., has been made district sales engineer at Williston.

Robert L. Jenkins, operator No. 2 at Williston, has been promoted to station superintendent at Glendive.

Gorman-Rupp Names Erbe

G. W. ERBE

George W. Erbe has been appointed district representative for Gorman-Rupp Co., Mansfield, Ohio, with his headquarters in Houston. Joining the organization this past summer, Erbe was formerly associated with A. O. Smith Corp. at San Francisco, Los Angeles, and Houston as a sales engineer for electric motors and deep-well turbine pumps.

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Built to be Reliable ... When Reliability Counts Most!

"LONG LIFE" STYLE D-115. An improved wrapped duck construction that has greater flexibility, is lighter in weight and coils flat on the reel. Synplastic cover prevents moisture penetration, and provides exceptional resistance to abrasion, oil, and sun rays. Sizes 1½", 2" and 2½".

COTTON RUBBER LINED. Single or Double Jacket. Well-known for its superior strength and lasting qualities. Long-fibre cotton duck jacket withstands hard wear and rough treatment, and resists snagging and puncturing. Tough, durable rubber lining. All standard sizes.

"INFERNO" STEAM HOSE. For fire smothering. Famous for safety. Wire braid construction with red synplastic cover.

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Est. 1870

For complete specifications write for Bulletin 50.

ACCURATE GAS PRESSURE

The RS Standard Dead Weight Gage facilitates testing gas pressures; rock pressure at wells; static pressure on orifice meters and pipe line pressure in locating leaks. The design of the gage is based on the principle of applying pressure by a known weight to a hydraulic piston of known area; and of the converse effect to measure unknown pressure by balancing its force on a piston of known area with a known weight.

THE INSTRUMENT IS CALIBRATED TO INDICATE PRESSURES WITH A PRECISION OF 0.1%.

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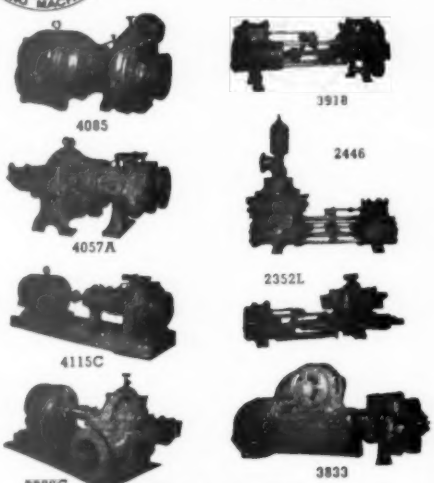
Since 1869



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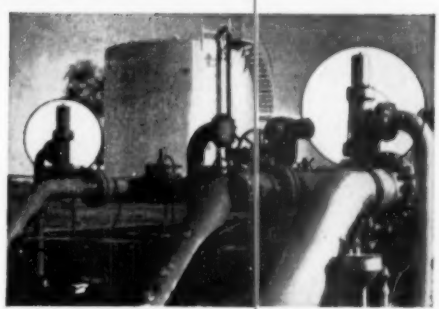

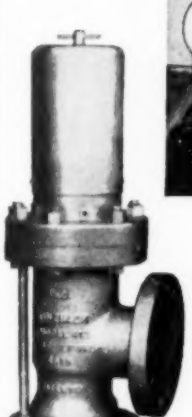

Positive Protection Against Pressure Surges

KINZBACH MODEL 412 RELIEF VALVE FOR PIPELINES AND REFINERIES

When a pressure overload in the line is reached, the Kinzbach Model 412 Relief Valve opens instantly to full capacity. This valve provides automatic resetting at a pre-determined pressure drop, positive seating and facilities for functional testing.

The Model 412 uses line pressure for opening and closing. The opening pressure is preset by application of a dead weight load. Opening and closing action is positive and reliable. The pre-set pressure never changes.

Kinzbach Model 412 Relief Valves are available in 2", 3", 4", 6" and 8" sizes for working pressures up to 1000 p.s.i. Write for Bulletin RV412 for full technical data.

KINZBACH TOOL CO INC

KINZBACH TOOL COMPANY, INC.
P. O. Box 277 Houston, Texas
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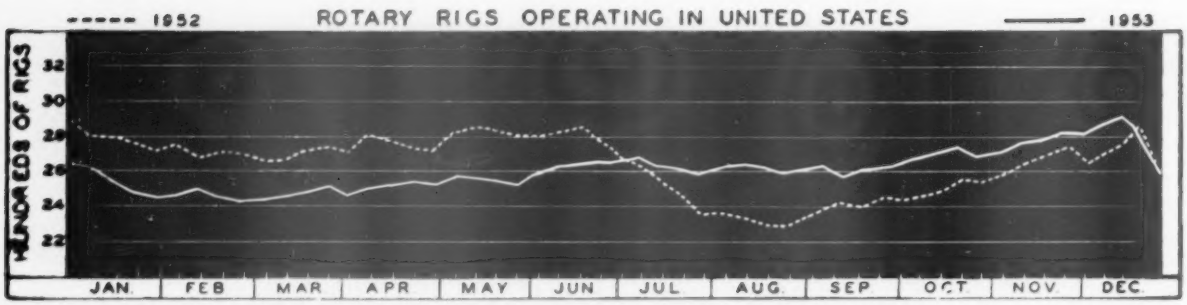
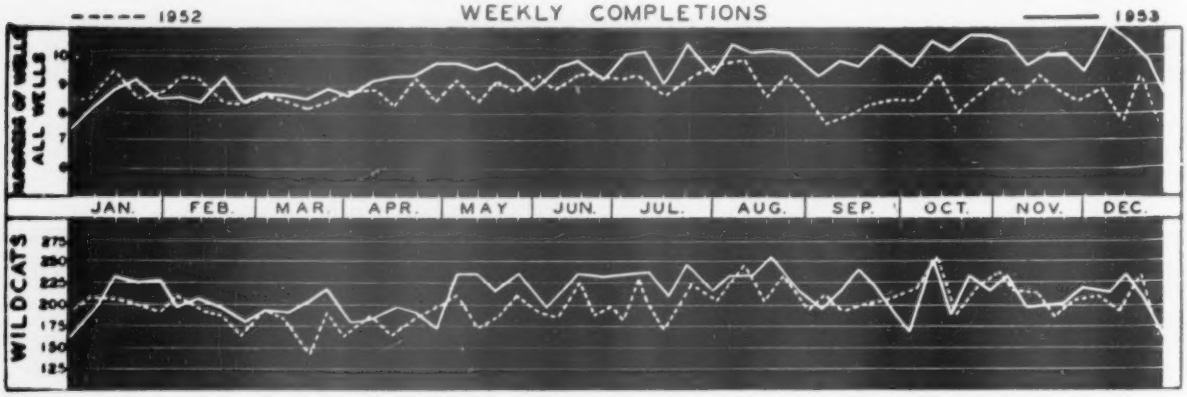




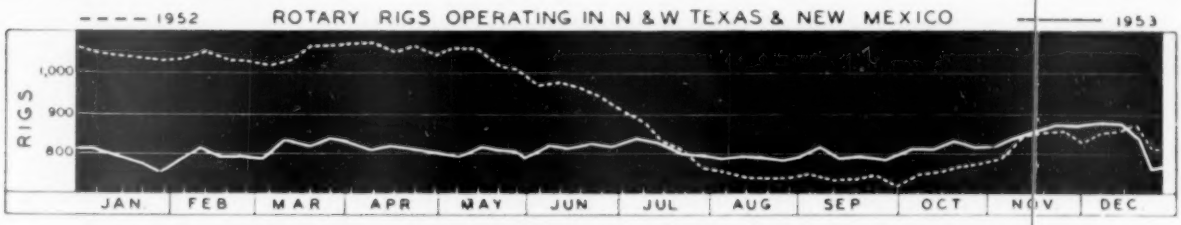
CURRENT STATISTICS

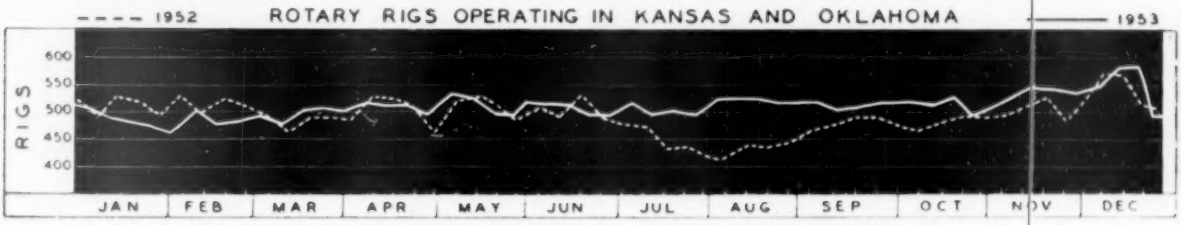
EXPLORATION

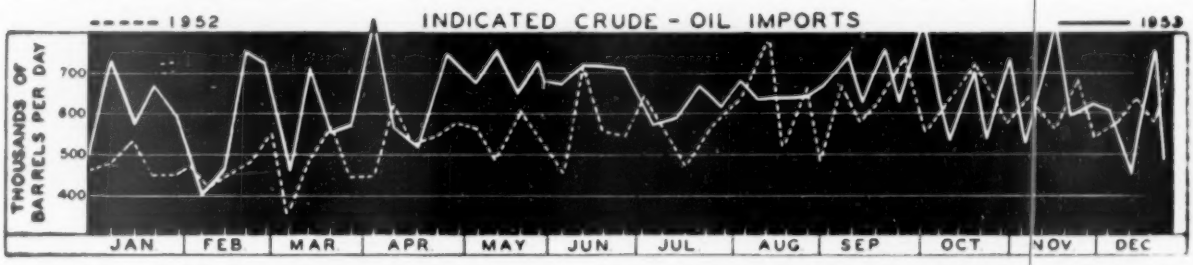
WEEKLY WELL COMPLETIONS . . . WEEK ENDED JANUARY 2, 1954

	Total of all wells							Wildcat completions and discoveries									
						Jan. 2							Cumulative total, 1954				
	Comp.	Oil	Gas	Dry	Footage	1954	1953	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Pennsylvania-New York	53	26	5	*22	108,928	15	15	0	0	1	2	3	0	0	1	2	3
West Virginia	11	2	7	2	26,682	3	2	0	0	0	0	0	0	0	0	0	0
Ohio	10	5	3	2	18,236	3	5	0	0	1	0	1	0	0	1	0	1
Indiana	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Kentucky	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Illinois	14	8	0	6	34,551	4	7	0	0	0	3	3	0	0	0	0	0
Michigan	12	6	1	5	31,755	3	3	4	0	1	3	8	1	0	1	0	2
Kansas	76	41	1	34	254,997	21	14	2	0	0	11	13	0	0	0	3	3
Nebraska	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Oklahoma	163	107	13	43	542,470	46	31	1	0	2	5	8	0	0	0	1	1
Texas	310	173	11	126	1,501,380	87	72	11	1	0	77	89	2	0	0	20	22
North Central (Dist. 7-B & 9)	115	58	0	57	399,218	33	23	5	0	0	31	36	1	0	0	9	10
West (Dist. 7-C & 8)	87	61	0	26	469,669	25	17	4	0	0	16	20	1	0	0	4	5
Panhandle (Dist. 10)	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Eastern (Dist. 5 & 6)	20	8	6	6	107,149	5	2	0	0	0	3	3	0	0	0	0	0
Gulf Coast (Dist. 2 & 3)	47	23	3	21	303,492	13	12	0	1	0	13	14	0	0	0	3	3
Southwest (Dist. 1 & 4)	41	23	2	16	221,852	11	16	2	0	0	14	16	0	0	0	4	4
Louisiana	70	42	12	16	300,215	20	17	2	0	1	2	5	0	0	0	0	0
Northern	56	37	9	10	155,849	16	12	0	0	0	1	1	0	0	0	0	0
Southern	14	5	3	6	144,366	4	5	2	0	1	1	4	0	0	0	0	0
Arkansas	32	25	0	7	109,901	9	3	1	0	0	3	4	1	0	0	0	1
Mississippi	5	3	1	1	39,203	1	1	0	0	0	1	1	0	0	0	0	0
Southeastern States	1	0	0	1	5,808	0	0	0	0	0	1	1	0	0	0	0	0
Montana	1	1	0	0	10,370	0	3	0	0	0	0	0	0	0	0	0	0
Wyoming	18	13	0	5	83,213	5	3	1	0	0	1	2	0	0	0	0	0
Colorado	9	4	0	5	41,660	2	3	0	0	0	5	5	0	0	0	1	1
Utah	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New Mexico	23	11	11	1	135,883	6	2	0	0	0	0	0	0	0	0	0	0
California	55	38	0	17	272,441	15	16	3	0	0	15	18	3	0	0	4	7
North Dakota	9	7	0	2	65,538	2	1	2	0	0	2	4	1	0	0	0	1
Miscellaneous	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total United States	872	512	65	295	3,583,231	242	204	27	1	6	131	165	8	0	3	31	42
Total previous week	988	547	72	369	3,895,105			31	0	7	166	204					
Total January 3, 1953	739	382	44	313	3,056,706			19	1	8	135	163	8	0	3	57	68

Service wells included: *17, 12.



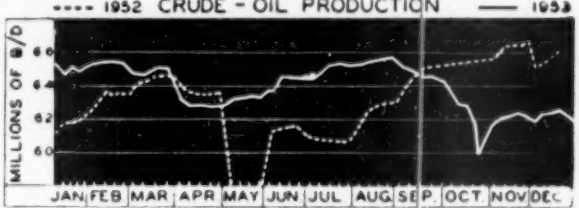


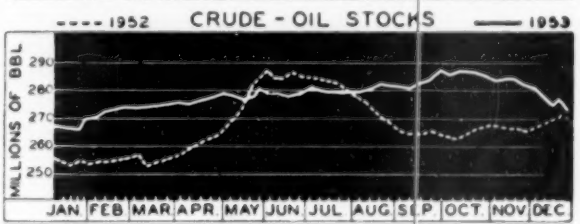


DAILY AVERAGE PRODUCTION FOR WEEK

	January 2 — Crude oil	Lease condensate	Total	Dec. 26 total
Alabama	4,300		4,300	4,400
Arkansas	75,250	600	75,850	77,150
California	1,010,200		1,010,200	1,010,800
Colorado	105,300		105,300	109,800
Eastern	59,400		59,400	59,500
Florida	1,475		1,475	1,475
Illinois	166,900		166,900	169,800
Indiana	32,900		32,900	32,400
Kansas	240,800		240,800	304,600
Kentucky	32,200		32,200	32,100
Louisiana	628,150	44,050	672,200	666,750
North	104,350	3,550	107,900	108,250
South	523,800	40,500	564,300	558,500
Michigan	33,700		33,700	32,400
Mississippi	90,850	3,400	94,250	96,500
Montana	34,800		34,800	34,300
Nebraska	18,500		18,500	14,400
New Mexico	194,450	900	195,350	193,600
Oklahoma	535,100		535,100	532,400
Texas	2,575,225	49,150	2,624,375	2,606,225
Dist. 1	38,825	450	39,275	39,000
Dist. 2	134,925	6,325	141,250	141,200
Dist. 3	413,700	23,750	437,450	435,900
Dist. 4	239,525	6,100	245,625	245,550
Dist. 5	44,500	450	44,950	44,800
Dist. 6	113,700	5,400	119,100	119,300
East Texas field	231,110		231,100	231,100
Dist. 7-B	120,750	50	120,800	120,550
Dist. 7-C	160,225	4,625	164,850	159,350
Dist. 8	816,650	1,500	818,150	809,100
Dist. 9	183,550	450	184,000	182,825
Dist. 10	77,775	50	77,825	77,550
Utah	4,800		4,800	5,000
Wyoming	241,600		241,600	243,200
North Dakota	13,900		13,900	14,500
Total U. S.	6,099,800	98,100	6,197,900	†6,241,300
Change from previous week, down			43,400	
Canada	288,650		288,650	288,650
Total U. S. production January 1-2				12,395,800 bbl.
Same period last year (crude plus cond.)				*13,167,400 bbl.

*Includes 176,150 bbl. condensate. †Revised.



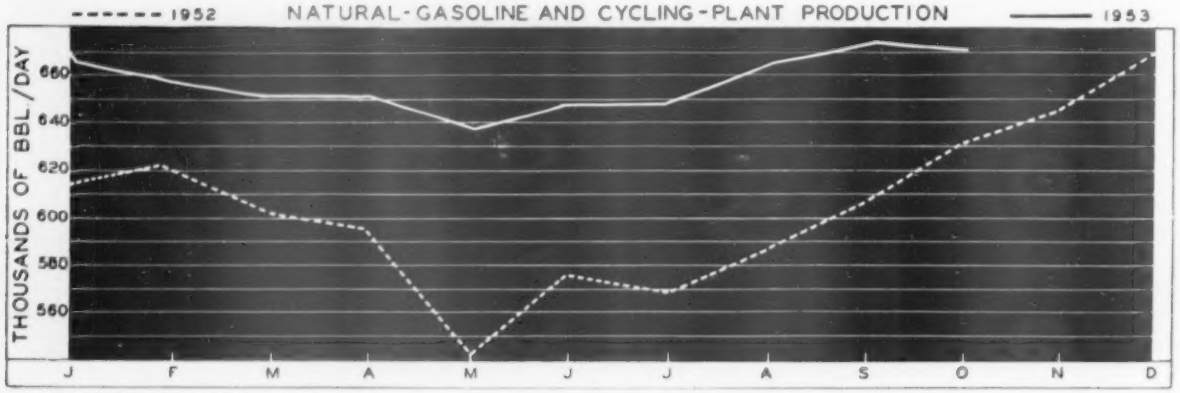


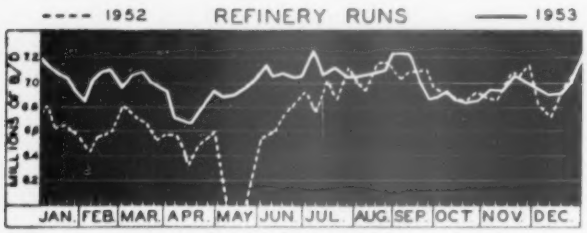
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

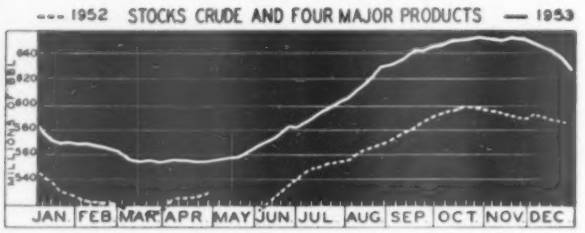
(Thousands of barrels)

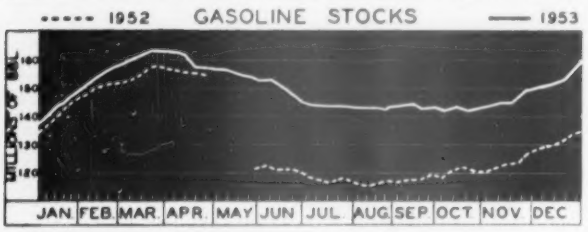
	Dec. 26, '53	Dec. 19, '53	Dec. 27, '52
Pennsylvania Grade	2,656	2,662	2,169
Other Appalachian	1,579	1,634	1,785
Illinois, Indiana, Michigan	11,952	12,390	10,673
Arkansas	3,298	3,301	3,213
Louisiana	16,939	17,848	15,451
North	2,826	3,025	2,342
Gulf	14,113	14,823	13,109
Mississippi	3,654	3,452	3,060
New Mexico	9,054	8,881	7,427
Oklahoma and Kansas	35,227	35,595	36,763
Texas	127,407	129,051	133,643
East Texas	11,496	11,451	11,343
West Texas	54,520	56,284	61,156
Texas Gulf	26,273	26,054	26,452
Other Texas	35,118	35,262	34,692
Rocky Mountain	17,083	16,962	14,431
California	34,199	33,717	31,462
Foreign	†10,469	11,773	8,633
Total	273,517	277,166	268,710

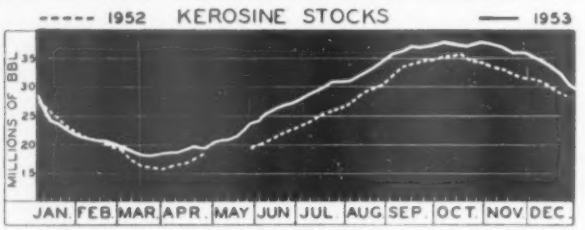
*Bureau of Mines. †Includes 3,118,000 bbl. in California.

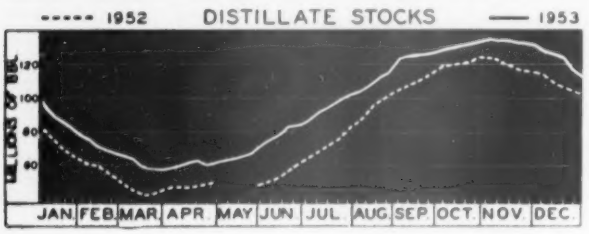


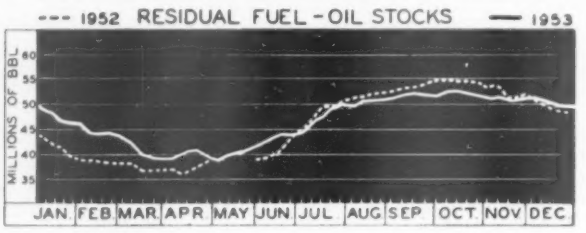












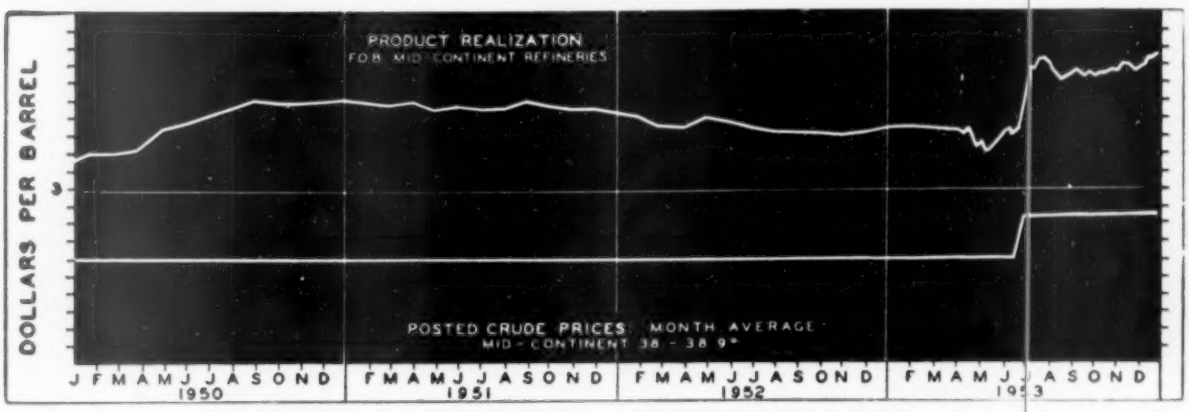
(Report for Week Ended December 26 Is on Page 187)

A.P.I. REFINERY REPORT, JANUARY 2

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, January 1953—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,069	446.1	49.9	265.4	233.8	34,465	13,196	43,761	11,895	1,080	452.9	48.5	259.9	260.9
Appalachian:														
District 1	127	53.6	8.1	31.0	18.4	4,139	636	1,537	880	116	48.9	9.3	19.6	19.2
District 2	102	50.9	6.0	18.0	12.0	2,124	556	698	197	92	47.6	7.9	14.3	16.1
Ind., Ill., Ky.	1,357	712.1	92.4	226.7	203.6	32,681	7,515	19,390	4,423	1,324	689.6	104.0	246.0	194.9
Okla., Kans., Mo.	587	347.3	19.9	149.6	44.8	17,227	1,453	10,751	1,161	582	330.9	12.6	141.1	62.4
Inland Texas	238	193.1	11.1	33.7	26.6	6,114	374	2,190	1,297	273	184.4	15.5	41.3	39.4
Texas Gulf Coast	1,675	831.2	151.7	379.1	233.3	23,090	2,614	12,559	6,312	1,742	790.3	155.7	441.4	253.0
La. Gulf Coast	546	305.3	69.2	121.7	46.3	10,011	1,638	6,087	1,562	524	239.5	56.3	130.4	50.9
N. La. and Ark.	92	37.0	10.1	12.0	6.6	3,834	469	879	172	286	35.5	8.5	18.3	8.1
Rocky Mountain:														
New Mexico	20	13.1		2.9	2.9	217		57	29	20	12.1	0.7	2.6	4.0
Other Rocky Mtn.	254	122.9	3.7	60.9	42.0	5,898	236	2,535	871	229	117.2	7.1	47.4	43.4
California	1,135	479.0	9.3	178.7	387.6	20,275	394	13,138	20,636	974	435.0	7.2	166.1	354.6
Jan. 2, 1954	7,202	3,591.6	431.4	1,479.7	1,257.9	160,075	29,081	113,582	49,435	7,042	3,383.9	433.3	1,528.4	1,306.9
Dec. 26, 1953	7,011	3,598.9	357.9	1,421.7	1,243.1	156,030	30,251	117,231	49,810					
Jan. 3, 1953	7,221	3,472.3	429.9	1,558.9	1,360.6	137,016	28,094	99,713	49,459					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipe lines.


PRODUCT REALIZATION
F.O.B. MID-CONTINENT REFINERIES
DOLLARS PER BARREL
3
POSTED CRUDE PRICES: MONTH AVERAGE
MID-CONTINENT 38 - 38.9°
J F M A M J J A S O N D
1950
F M A M J J A S O N D
1951
F M A M J J A S O N D
1952
F M A M J J A S O N D
1953

In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate and fuel oil. Realization averaged $3.78 for week ended December 26, $3.74 for previous week, and $3.36 for December 1952. The above trend information is based on volumes and current prices and therefore does not reflect changes in operating costs.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of January 6, 1954. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10.875-11.5	12.5-13.5	10.75-11.75
Premium gasoline	11.875-12.5	13.75-14.5	11.75-12.75
42-44 w.w. kerosine	8.875-9.25	10.15-10.4	8.875-9.5
No. 2 straw fuel oil	7.875-8.25	9.15-9.4	8.125-8.5
No. 6 residual	$1.50-1.60	$2.25-2.40	$1.85-1.95

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5.5	5.0	5.25
Grade 18-55	6.6	6.10	6.35

LUBRICATING OILS
South Texas

200 vis., No. 2-3 neutral	12.5-13.75
750 vis., No. 3-4 neutral	15.5-16.75
2,000 No. 5-6 neutral	17-18.75

LUBRICATING OILS
Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	19.5
200 vis., No. 3 neutral, 0-10 pp.	14.25

Western Pennsylvania

145-155 vis., 10 p.t. bright stock	20.5
180 vis., 10 p.t. neutral	24.5

WAX
Mid-Continent

132-134 A.M.P.	6.0

AGAIN, the lowering of a price on the East Coast represents a correction of an existing market condition rather than a further softening of the market itself. In fact, the market is probably firmer than before the price reduction.

Announcement of a voluntary and temporary discount of 0.25 cent a gallon on barge deliveries of No. 2 fuel in New York Harbor was made by a major marketer, effective January 1. During the week ended December 26, distillate stocks on the East Coast were reduced 1,289,000 bbl. On the Gulf Coast, the reduction amounted to 2,026,000 bbl.

Also, reports of shading from the normally quoted price of 8.125 cents a gallon for No. 2 on the Gulf Coast have stopped. Material had been available at 8 cents.

Reports for several weeks have indicated discounts in New York Harbor for barge deliveries of No. 2 fuel. These discounts were off the regularly quoted price of 9.4 cents a gallon. The announcement on the voluntary allowance brings the barge price to 9.15 cents. Since the current New York Harbor contract cargo price of 8.8 cents a gallon is based on a firming Gulf Coast market of 8.125 cents and clean tanker rates of USMC minus 10 per cent, it is unlikely that it will be reduced. The difference between the old contract barge quotation of 9.4 cents and the cargo price of 8.8 cents was enough to encourage discounts in a market that was under pressure from high inventories. The reduction of the differential between barge and cargo prices from 0.6 cent to 0.35 cent has replaced discounts with open quotations.

Prices paid for Pennsylvania Grade crude dropped again on January 1. Reductions ranged from 29 to 35 cents a barrel. Details are carried in a story in the news section.

CRUDE PRICES
GRAVITY SCHEDULE

	Signal Hill, Calif.*	Okla-homa, Kansas	Gulf Coast Tex.†	West Tex.‡
14-14.9	$1.87			
15-15.9	1.93			
16-16.9	1.99			
17-17.9	2.05			
18-18.9	2.11			
19-19.9	2.18			
20-20.9	2.24	$2.50		$2.37
21-21.9	2.30	2.52		2.39
22-22.9	2.37	2.54		2.41
23-23.9	2.45	2.56		2.43
24-24.9	2.53	2.58	$2.91	2.45
25-25.9	2.61	2.60	2.93	2.47
26-26.9	2.69	2.62	2.95	2.49
27-27.9	2.76	2.64	2.97	2.51
28-28.9	2.83	2.66	2.99	2.53
29-29.9	2.91	2.68	3.01	2.55
30-30.9	2.97	2.70	3.03	2.57
31-31.9	3.04	2.72	3.05	2.59
32-32.9	3.12	2.74	3.07	2.61
33-33.9		2.76	3.09	2.63
34-34.9		2.78	3.11	2.65
35-35.9		2.80	3.13	2.67
36-36.9		2.82	3.15	2.69
37-37.9		2.84	3.17	2.71
38-38.9		2.86	3.19	2.73
39-39.9		2.88	3.21	2.75
40 and above		2.90	3.23	2.77

*Standard Oil Co. of California. †Upper Texas Gulf Coast ‡Includes New Mexico Permian.

Prices East of California effective June 15, 1953. California prices effective February 16, 1953. Pennsylvania Grade prices effective January 1, 1954.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Hollow[illegible]y crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	3.76
Middle District	3.70
Southwest Pennsylvania	3.31
West Virginia	3.25
Ohio	3.24
Illinois Basin	3.02

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Address Classified Advertising Material: The Oil and Gas Journal, P. O. Box 1260, Tulsa 1, Okla.

HELP WANTED

MAN with minimum of two years experience on electric and/or radio activity logging interpretation. Opportunity for advancement with major oil company—probable location Tulsa. Salary commensurate with experience and ability. Box G-837, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER BS, age to 35, 3 to 5 years experience in hydrocarbon process plant design, Gulf Coast location. Reply should include full resume of education, experience, references and salary expected Box G-836, The Oil and Gas Journal, Tulsa, Oklahoma.

CHIEF CHEMIST experienced in Pod column work and gasoline plant process and product control testing to take charge of laboratory located at large gasoline plant in West Texas. Housing furnished and salary to be commensurate with qualifications of applicant. Please furnish experience record and salary expected. Our employees have been notified of this advertisement. Box G-776, The Oil and Gas Journal, Tulsa Oklahoma.

INSTRUMENT MECHANIC

Major Oil Company in Venezuela has opening for Instrument Mechanic with minimum of 2 years' experience in repairing and maintaining controls, recorders, and safety shut-down instruments normally used in compressor plants and natural gas absorption plants.

WRITE GIVING FULL DETAILS TO:

P.O. Box No. 35

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New York 4, New York

PETROLEUM ENGINEERS

(Age 21-30, preferably single)

Desired by major oil company for career opportunities in South America.

Work in various phases of aggressive drilling and production programs. Good opportunity for advancement. Minimum requirements: Degree in engineering from accredited institution, 0-10 years' experience in petroleum engineering field. Salary plus bonus: $6700-11,000. Also liberal benefits, tax savings and home vacations with traveling expenses. Replies confidential.

Box 1540

Department M

General Post Office

New York 1, New York

HELP WANTED

WANTED: Graduate Petroleum Engineer for applied Engineering field work. Salary open. Remuneration far above average. Box 7288, Houston 8, Texas.

SOUTH AMERICA. Major Oil Company. Our fee paid. Mechanical Engineer—Petroleum Engineer—Chemical Engineer—Geologist—All requiring Degree, experienced or inexperienced. Mud Technician—Two or more years' experience, single. Tool Pusher—under 40, three years' experience. Accountant—Degree, Accounting major, single. All information confidential. Contact CHAS. J. LOVELESS PERSONNEL SERVICE, 616 S. Main, Tulsa, Oklahoma. Phone 3-5163.

WANTED TECHNICAL WRITER

Man or woman, college graduate, with background of chemistry or chemical engineering to assist in preparing articles and abstracts. Will work closely with outstanding petroleum chemist in Midwest. Liberal employee benefits. All applications strictly confidential. Please send complete resume giving age, education, experience, and salary desired to:

Personal Director

UNIVERSAL OIL PRODUCTS COMPANY
30 Algonquin Road
Des Plaines, Illinois

ASS'T SUPERINTENDENT
Gas Department

Major Oil Company in Venezuela has opening for graduate Engineer with 7-10 years' experience in operational and administrative functions of Gas Department to supervise department construction program and conduct engineering and economic studies.

WRITE FULL DETAILS TO:

P.O. Box No. 35

BOWLING GREEN STATION
New York 4, New York

INDEPENDENT Recycling Plant operating in conjunction with pressure maintenance on 3 reservoirs requires reservoir engineer. Project located in Louisiana. Housing furnished and salary to be commensurate with qualifications of applicant. Box G-849, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

CRUDE PRODUCTION man, executive caliber, familiar all phases production, with acquaintance major and independent companies production departments. Replies confidential. Box G-859, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREIGN OIL JOBS. During 1954 an oil company client of ours will need many men experienced in various phases of drilling and production, in his overseas operations. Contact Tom Robinson, owner, Oil Industry Employment Service, 405 Tuloma Bldg., Tulsa, Okla. 4-5974.

MAJOR OIL COMPANY desires Assistant Gasoline Plant Superintendent with minimum of 3 years' experience in Natural Gasoline Plant or Refinery Operations and maintenance. College graduate with specialization in engineering subjects. Give full details in reply to P. O. Box 2819, Dallas, Texas.

SEISMIC SUPERVISOR required by expanding and aggressive seismic contracting company. Should have ability to supervise any domestic area and have good professional contacts. Minimum requirements college degree in geophysics or related fields and eight years' seismic experience. Good future. Tulsa location. Box G-705, The Oil and Gas Journal, Tulsa, Oklahoma.

THE POSITION YOU WANT: Oil industry companies are looking for men to fill every conceivable kind of position. If you didn't find the position in this column that you are looking for, use a "Situation Wanted" classified advertisement to state your qualifications. Some company is probably looking for your ability. See box heading for classified rates or write The Oil and Gas Journal.

HELP WANTED

Engineers with petroleum refinery operating experience. Several positions open to qualified engineers for field service duties in new refinery set-up and operations. Applicants must be willing to travel. All applications strictly confidential. Please send complete resume giving age, education, experience and salary desired to

Box G-848

The Oil and Gas Journal
Tulsa, Oklahoma

HELP WANTED

GEOLOGISTS

SUBSURFACE

With degree in Geology and a minimum of 3 years' subsurface experience on deep wells. To work in Saudi Arabia on deep wells making lithologic and faunal logs from cores and cuttings, interpreting electrical logs and working on field and regional stratigraphic studies. Salary commensurate with experience and qualifications.

JUNIOR

Recent graduate with B.S. in Geology with knowledge of micropaleontology and subsurface methods. Experience desirable but not essential.

MICROPALEONTOLOGIST

Preferably with an advanced degree and a minimum of 5 years' commercial or academic experience. To work in the New York research laboratory of a major oil company. This position demands broad interests in Stratigraphy and Biofacies and the capacity to do independent work on projects assigned. Salary dependent on experience and qualifications.

Write giving personal history and work experience. Please include telephone number.

RECRUITING SUPERVISOR

BOX OGJ

Arabian - American Oil Company

505 Park Avenue
New York 22, N. Y.

SITUATIONS WANTED

ACCOUNTANT, oil production and heavy industrial experience. Prefer to remain in Texas. Box G-824, The Oil and Gas Journal, Tulsa, Oklahoma.

PRACTICAL GEOLOGIST, 33, married, 10 years experience surface and subsurface exploration, subsurface development, and reserve estimation, West Texas and New Mexico, desires responsible position with aggressive Oil Company. Box G-858, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED LAND MAN: Age 50, 24 years experience, mostly with major companies in Texas, New Mexico, Louisiana, Mississippi, Georgia, Florida, Alabama. Degree Civil Engineering plus 1 year Geology, plus 1 year Law. Qualified for any position in Land Department. Free to move to any area. Box G-835, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: Single, 26, B.S. Geology. Three years seismic interpretation. Desires geological position, preferably combining geology and geophysics in Rocky Mountain Area or Canada. Box G-857, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

SUBSURFACE GEOLOGIST—31, married, 2 years seismograph, 7 years' major company field-office experience Mid-Continent area, desires to relocate with independent company. Box G-841, The Oil and Gas Journal, Tulsa, Oklahoma.

EXECUTIVE — CERTIFIED PUBLIC ACCOUNTANT—COLLEGE DEGREE offers 17 years' experience in developing and managing oil and gas properties, operating hydrocarbon recovery plants. Familiar with taxes, financing, marketing, lease arrangements, joint ventures. Seeking responsible position in Houston. George D. Blocher, 3638 Wichersham Lane, Houston 19, Texas.

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No 668. Ph. No. 3-3141, Hobbs, New Mexico.

C.P.A. DESIRES position as controller, treasurer, office manager, with oil company or related organization. 24 years extensive, diversified experience with oil industry, including producing, refining, and marketing. Public accounting and tax background. Presently employed in managerial capacity. Middle 40's, married, will relocate. Resume on request. Box G-831, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, 30, married, 4 years varied experience—reservoir, production, completions, remedial work. Desires responsible position with aggressive independent or individual. Box G-839, The Oil and Gas Journal, Tulsa, Oklahoma.

EXECUTIVE ACCOUNTANT, management experience with completely integrated independent petroleum companies, desires to relocate. Box G-845, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST, desires position as Seismic Supervisor. Thirteen years experience. Education in electronics and geology. Particularly interested in record reinterpretation. Box G-833, The Oil and Gas Journal, Tulsa, Oklahoma.

MAN WITH 30 YEARS' experience in production and drilling desires production job. Box G-853, The Oil and Gas Journal, Tulsa, Oklahoma.

SUBSURFACE GEOLOGIST, five years' with major, needs immediate change. Consider anything. Box G-852, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEER, 30, 4 years Major, 1 year Foreign, MS in ME, desires drilling production position w/Major or Independent. Prefer West Texas or Mid-Continent assignment. Box G-851, The Oil and Gas Journal, Tulsa, Oklahoma.

YOUNG BUSINESS MAN (26) desires position with crude oil producer. Three years' experience in sales and finance. Graduate of well-known eastern college. Married, veteran. Box G-850, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Position in purchasing. 27 years in oil refining. Know refining equipment. Box G-856, The Oil and Gas Journal, Tulsa, Oklahoma.

THE RIGHT MAN: Can you fill the position you have open from the qualifications listed in this column. Men are always looking for an opportunity to improve themselves. Use a "Help Wanted" Journal classified advertisement to find the men you need. See box heading for classified rates or write The Oil and Gas Journal.

EQUIPMENT FOR SALE

FOR SALE: Failing Model 1500 drilling equipment. Have available for sale several drills exceptionally complete and in excellent condition. Particularly suitable for water well or deep core work. This equipment relatively new and now operating. Substantial savings possible. Box G-738, The Oil and Gas Journal, Tulsa, Oklahoma.

REFORMING or gas oil thermal Alco cracking furnace, 1500 sq. ft. carbon steel tubes, 1735 sq. ft. 2% chrom. .5% moly alloy tubes, good condition. And 1300 ft. 2.0% chrom. 1% moly alloy pipe 8" OD x 6.75 ID. For further information write or wire Purchasing Department, P. O. Box 1117, Shreveport, Louisiana.

EQUIPMENT FOR SALE

REDA PUMP complete w. #4—20 Motor 45½ H.P., 650 Volt, 41.6 Amps. #50—Pump Housing. #5595—Switchboard w/recording Ammeter 3400'—#4 Cable 125 Amp. Auto Transformer Accessories. Engine 225 H.P. Climax Type R-225 on Skid. Alternator G. E. 125—KVA. 100 KW, 440 V. A. C. w/Transformer, Flexible coupling and skid base. House—10' x 18' wood frame, w/G.I. Roof and Siding on Skid. Engine—165 Hp Climax R-61 on Skid. Herndon Drilling Co., 421 Mayo Bldg., Tulsa. Phone 4-9700.

250,000 FT. 8⅝ o.d. pipe with collar and plain end. $1.00 per foot Oklahoma. Rogers & Lindquist, 620 Wright Building, Tulsa Okla. Phone 3-2072—5-8850.

SALES and rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma.

GAS METERS, Westcott, Foxboro and Emco. Good condition and can furnish most any type or capacity. Geo. R. Milner, Okmulgee, Oklahoma.

FOR SALE: 5450' new 7" 23# J-55, Pittsburg Seamless Casing, Range 3. Located near Wichita Falls, Texas. Price $2.20 per foot. Call 2-1868 or write Box 2588, Wichita Falls, Texas.

FOR SALE: Surplus Power Cylinder Heads, Clark RA Series, Worthington L-170, $95 Each, FOB South Texas. REFINERY MATERIALS CO., P.O. Box 14306, Houston 21, Texas.

TWO—11 FT. BY 50 FT. ASME U69 60 lb. pressure 19/32 inch vertical National board tanks. Lestan Corp., Rosemont, Pa.

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26"	O.D.	281 wall	1600 feet
24"	O.D.	406 wall	920 feet
24"	O.D.	281 wall	720 feet
20"	O.D.	281 wall	300 feet
16"	O.D.	250 wall	460 feet
12¾"	O.D.	250 wall	400 feet
10¾"	O.D.	250 wall	380 feet
9⅝"	O.D.	460 wall	1000 feet
9⅝"	O.D.	395 wall	1680 feet
8⅝"	O.D.	352 wall	1000 feet
7"	O.D.	317 wall	200 feet

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JOY 250, tandem trailer mounted with tools and drill pipe, located Tulsa. A-1 condition. Inquiries to Box 6147, Tulsa, Okla.

USED EXCELLENT CONDITION IN OPERATION

One Each (4¾" to 1") (13⅜" to 4½") LANDIS Leadscrew Receding Head Pipe Threading and Cutting Machine Motor Driven.

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Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

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LIMITED WAREHOUSE SURPLUS STOCK
NEW NORDSTROM PLUG VALVES
4—16" 300# "HYPRESEAL" (Fig. 4249)
3—12" 300# "HYPRESEAL" (Fig. 4249)
2—10" 300# "HYPRESEAL"
(4-6" Chrome)
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ONE-HALF FACTORY PRICE
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Also centrifugal pipe line pumps, valves, motors and electrical control equipment.

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250 Oxygen Cylinder, 150 Cu. Ft., new, round bottom ICC-3A-1800	**$18.50 each**
150 Oxygen Cylinder, 40 Cu. Ft., round bottom, new ICC-3A	**9.50 each**
300 CO2 Cylinder, 5 lb., round bottom, new, ICC-3A-1800	**6.00 each**
2 OXYGEN PLANTS, Independent 02-B new, 600 Cu. Ft. per hour, 20-25 meters, complete less power unit	**4,500.00 each**
1 OXYGEN PLANT, same as above but trailer skid mounted	**5,000.00**
1 ACETYLENE PLANT, Linde, used, 500 cu. ft. per hour, complete, ready to run, excellent shape	**5,000.00**
1 OXYGEN PLANT, Air Products, 600 cu. ft. per hour, complete, liquid pump type, used slightly but completely overhauled by factory	**8,500.00**
15 Kidde Type 2 Wheel Trailer Fire Extinguishers with 6 each 50 lb. and 2 each 15 lb. CO2 fire ext. and 90 ft. hose. Complete, never used	**395.00 each**
1 02-B Oxygen Column Only, New, 1000 cu. ft. per hour capacity	**1,800.00**
1 Nordberg Air Compressor, 1000 PSI, 5000 cu. ft. per hour, run less than 100 hours	**2,500.00**
1 Nordberg Oxygen Compressor, 2250 PSI, 1300 cu. ft. per hour, run less than 100 hrs.	**2,500.00**
4 Oxygen Compressor, Curtis, new, 2250 PSI, 750 cu. ft. per hour	**750.00 each**
1 Ingersoll-Rand Air Compressor, high pressure, 2500 PSI Type #40, 5000 cu. ft. per hour	**1,750.00**

DYE OXYGEN CO., INC., MFGRS.
3332 West McDowell Rd. Phoenix, Ariz.

EQUIPMENT FOR SALE

FOR SALE: (To settle estate) Complete Rotary Drilling Rig—U15 Unit Rig Draw Works with two ME66 Murphy Diesel Drive, 7¼ by 14 Emsco Pump, 96' Lee C. Moore Mast. Excellent Condition. Mrs. W. D. Kelley, Pampa, Texas.

SULLIVAN 200, tandem trailer mounted with tools and drill pipe, A-1 Condition, ready to go. Inquiries and inventory to Box 6147, Tulsa, Okla.

EVERYTHING in new and used equipment for well drilling. Fishing tools rented, save money, get quotations from Pressey & Son, Pueblo, Colorado.

WANT EQUIPMENT: Did you find the equipment you wish to purchase in this column? If not, use an "Equipment Wanted" classified advertisement to find it. It is available somewhere and Journal classified advertisements will find it. See box heading for classified rates, or write The Oil and Gas Journal.

EQUIPMENT WANTED

WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Green Pipe & Supply Co., Box 1333, Tulsa, Oklahoma.

NOTICE: We buy, We sell equipment everywhere. If you want to sell or buy, contact Pressey & Son, Pueblo, Colorado.

WANTED: 28L or 60 Bucyrus-Erie Spudder, with or without tools. Write Box 142, Jackson, Kentucky.

EQUIPMENT NOT IN USE: Did you find a buyer in this column for the equipment you have for sale. Someone wants it and an "Equipment For Sale" classified advertisement in the Journal will find a buyer. See box heading for classified rates or write The Oil and Gas Journal.

REAL ESTATE

SPACE IS NEEDED: A Journal display classified advertisement is the quickest way to rent or sell your real estate. In the present period of expansion oil industry firms urgently need the space you have available. If it isn't listed here, you may also find it by stating your needs in these pages. For classified rates see box heading or write The Oil and Gas Journal.

FOR SALE MAPS

SPECIALIZED EXECUTIVE Type Maps. 1953 Permian Basin Development Map shows all new pool discoveries and old pool extensions in red—old pools in blue. 1954 Permian Basin Field Map shows outline of all pools as of January 1, 1954, pool names, county outlines, principal roads and county seats. Ready for delivery after January 20, 1954. Price $2.50 each. Place your order now. Midland Map Company, Box 1211, Midland, Texas.

RANCHES

FOR SALE: 2027 acre Ranch Junction City, Kans. Highway well improved, electricity, 185 cultivated, creek bottom, 140 alfalfa, 1842 fine pasture, $72.50 per acre. O. Marty, Longford, Kans.

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OFFERING CHOICE ROYALTIES on geology in Oklahoma's greatest oil fields. A. S. Berry, 522 Wright Bldg., Phone 5-5402, Tulsa, Oklahoma.

FREE TAX INFORMATION for those desiring to sell their producing royalties, overrides or production. Robert L. Kinkaid, Box 26, Tulsa, Oklahoma.

GET TOGETHER: Both Capital and Royalties are available. If the investment proposition you want isn't listed in this column, use a Journal classified advertisement to find it. See box heading for classified rates, or write The Oil and Gas Journal.

LEASE AND DRILLING BLOCKS

WILL pay cash instantly for leases (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver, Colorado.

SEE A. L. Bowles, Rollow Building, Ada, Oklahoma, for drilling deals.

DAILY PRODUCTION FOR SALE shallow field, substantial proven acreage. Priced right. Box G-834, The Oil and Gas Journal, Tulsa, Oklahoma.

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LEGAL

Pursuant to the provisions of Chapter 150 of the General and Special Laws of the the State of Texas, passed by the 45th Legislature at its Regular Session, as amended by Senate Bill No. 248, passed by the 53rd Legislature at its Regular Session, the Board of Directors of the Agricultural and Mechanical College of Texas hereby offers for sale at public auction in the Office of the Comptroller, Room 201-D, System Administration Building, College Station, Texas, at 10:00 a.m. Thursday, February 25, 1954, the oil, gas, and sulphur lease on approximately sixty-six and seven-tenths (66.7) acres of land occupied by the Texas Agricultural Experiment Station, located near Jacksonville in Cherokee County, Texas, being a part of the Thomas Quevado Grant, conveyed to the State of Texas for the use and benefit of the Texas Agricultural Experiment Station of the Agricultural and Mechanical College of Texas by Deed dated January 15, 1943, and recorded in Volume 246, Page 39, of the Deed Records of Cherokee County, Texas. Only cash bids will be considered. The right is reserved to reject any and all bids. For lease forms and particulars, address Comptroller, Texas Agricultural and Mechanical College System, College Station, Texas.

A.P.I. REFINERY REPORT, DECEMBER 26

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, December 1952—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,014	448.0	35.9	238.0	243.8	33,404	13,525	45,533	45,476	1,058	441.8	45.2	283.8	247.8
Appalachian:														
District 1	123	50.9	5.3	27.6	13.3	4,240	630	1,449	857	108	48.3	5.9	18.8	14.5
District 2	82	43.6	5.1	17.1	7.8	1,991	568	702	171	94	47.9	7.6	15.0	15.1
Ind., Ill., Ky.	1,326	720.4	90.0	212.1	188.3	32,026	8,031	20,366	4,390	1,289	673.7	160.5	230.7	189.8
Okla., Kans., Mo.	552	351.3	13.6	126.6	45.6	16,597	1,531	10,840	1,179	566	333.2	14.3	139.3	63.9
Inland Texas	244	188.0	12.1	35.6	26.3	5,923	387	2,311	1,275	255	170.0	12.4	40.2	36.9
Texas Gulf Coast	1,681	842.4	133.7	386.8	241.4	22,392	2,947	13,367	6,620	1,717	802.0	139.2	427.3	262.5
La. Gulf Coast	526	284.0	48.6	126.6	63.6	9,244	1,405	6,103	1,672	553	267.9	71.0	123.8	56.4
N. La. and Ark.	83	37.3	6.4	16.0	5.3	3,684	593	814	165	85	34.9	9.8	19.5	7.1
Rocky Mountain:														
New Mexico	20	13.0		2.9	2.9	216		57	30	19	12.4	0.8	2.4	4.1
Other Rocky Mtn.	256	119.3	2.6	60.8	42.1	5,711	251	2,379	907	235	119.1	8.1	46.4	46.8
California	1,104	500.7	4.6	171.6	362.7	20,602	383	13,310	21,068	973	409.3	6.5	161.4	356.7
Dec. 26, 1953	7,011	3,598.9	357.9	1,421.7	1,243.1	156,030	30,251	117,231	49,810	6,952	3,360.5	421.3	1,508.6	1,301.6
Dec. 19, 1953	6,918	3,440.6	360.1	1,460.0	1,183.0	153,586	32,389	123,444	49,975					
Dec. 27, 1952	7,077	3,431.9	444.4	1,566.7	1,236.1	134,425	28,628	102,897	48,662					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipe lines.

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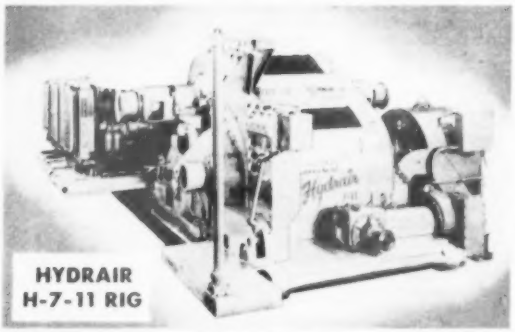

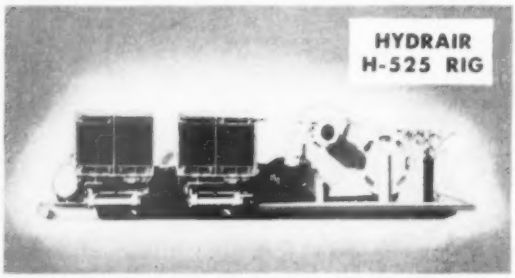

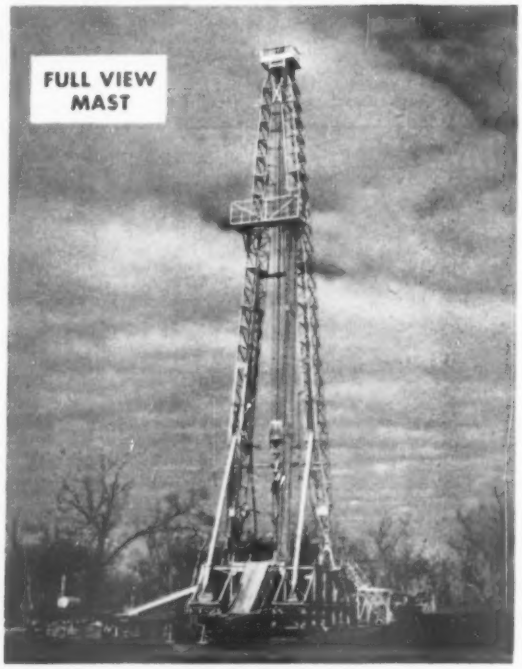

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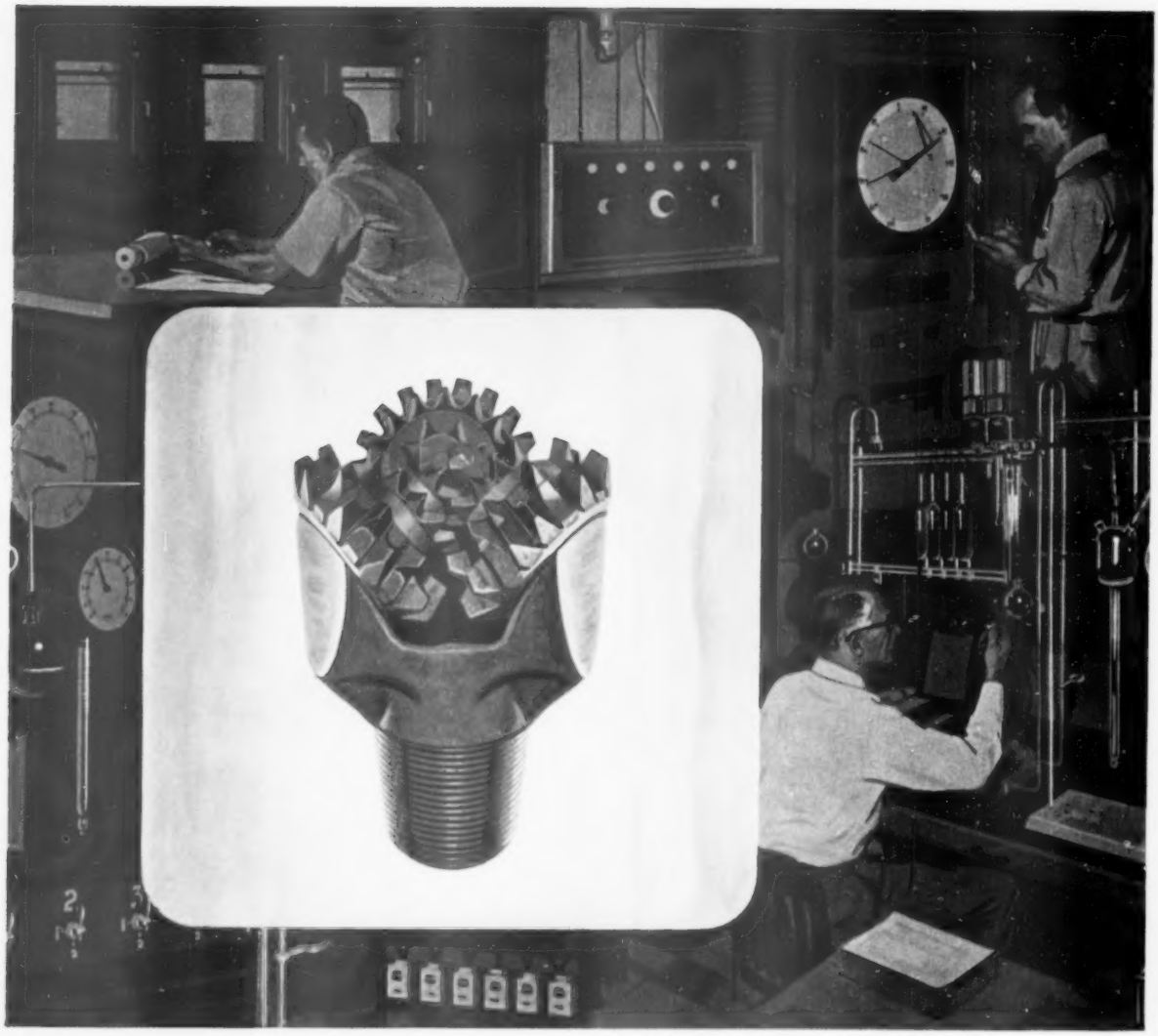

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